

Armed Forces College of Medicine

AFCM



Cranial Cavity 1

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Lecturer of Anatomy

INTENDED LEARNING OBJECTIVES (ILO)

By the end of this lecture the student will be able to:

1. Name the different Dural folds
2. describe their positions, shape, attachments
3. Mention their contents & function
4. Describe the intracranial course of the internal carotid artery
5. Describe course, surface anatomy and applied anatomy of the middle meningeal artery

MENINGES OF THE BRAIN



MENINGES OF THE BRAIN

- I- DURA MATER
- II- ARACHNOID MATER
- III- PIA MATER

MENINGES OF THE BRAIN



1- Dura Mater
(outer layer)

2- Arachnoid Mater (middle layer)

3- Pia Mater
(inner layer)

Middle meningeal vein and artery

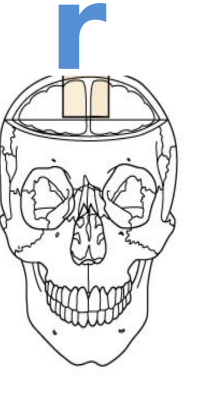
MENINGES OF THE BRAIN



Pia mater

- It is a thin, delicate membrane that closely invests the surface of the brain.
- It follows the contours of the brain, entering grooves and fissures on its surface





MENINGES OF THE BRAIN



Arachnoid mater

- It is a thin membrane.
- From its inner surface thin trabeculae extend downward, cross the subarachnoid space, and become continuous with pia mater

Arachnoid

MENINGES OF THE BRAIN



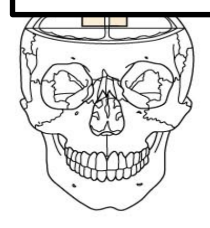
Dura Mater

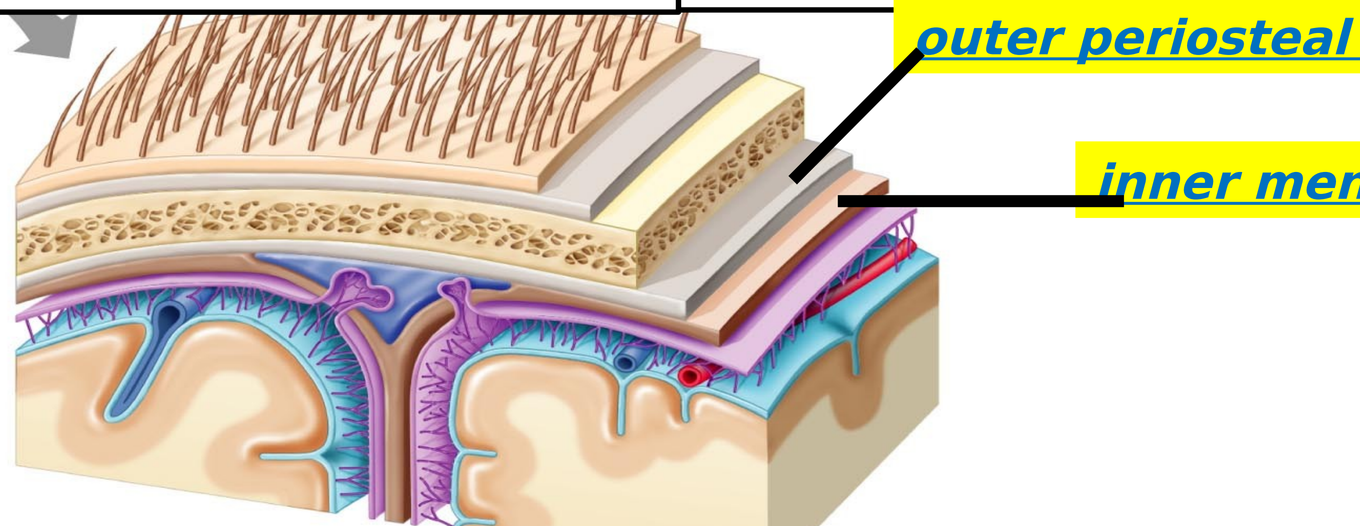
1- the outer periosteal layer

- It is the periosteum of the cranial cavity.
- It is firmly attached to the skull.

2- the inner meningeal layer

- It is in close contact with the arachnoid mater
- It is continuous with the dura mater of spinal cord .

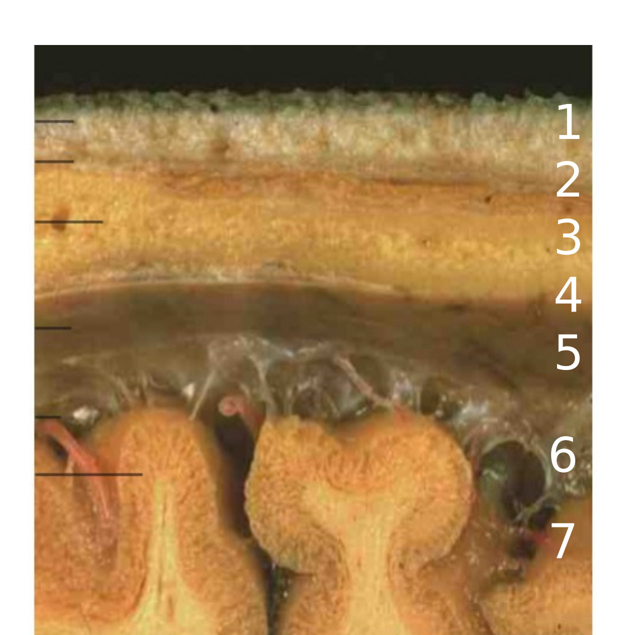


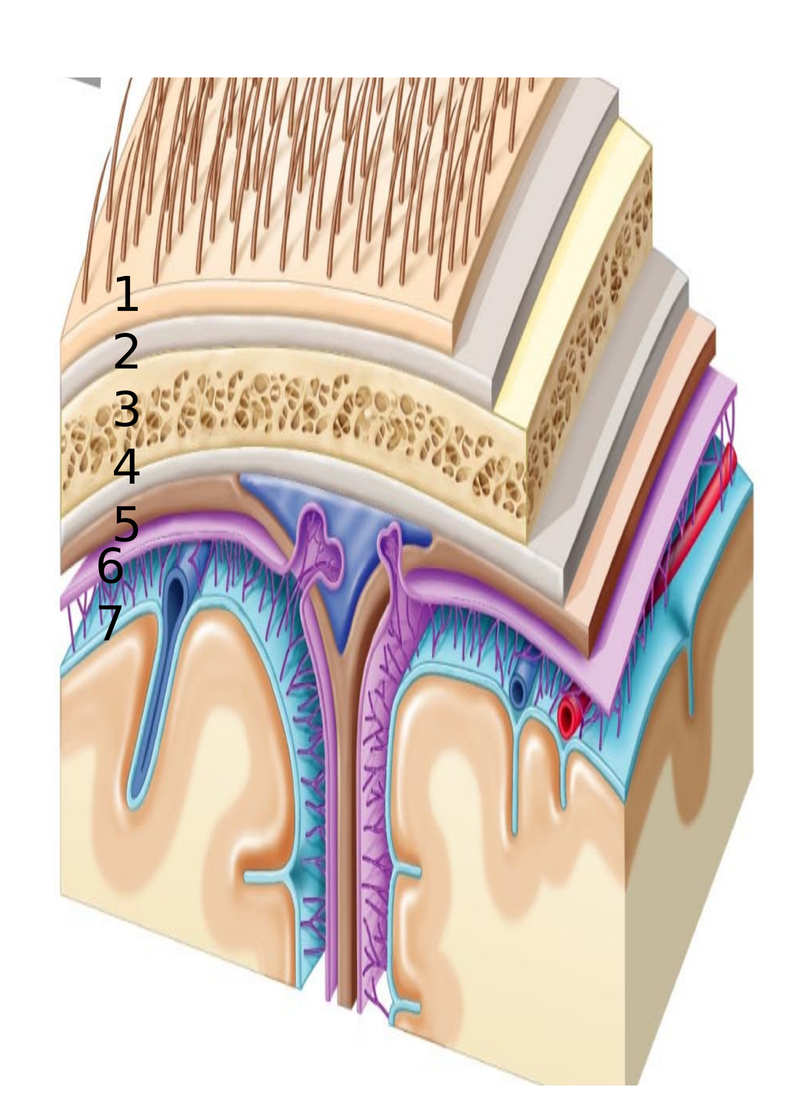


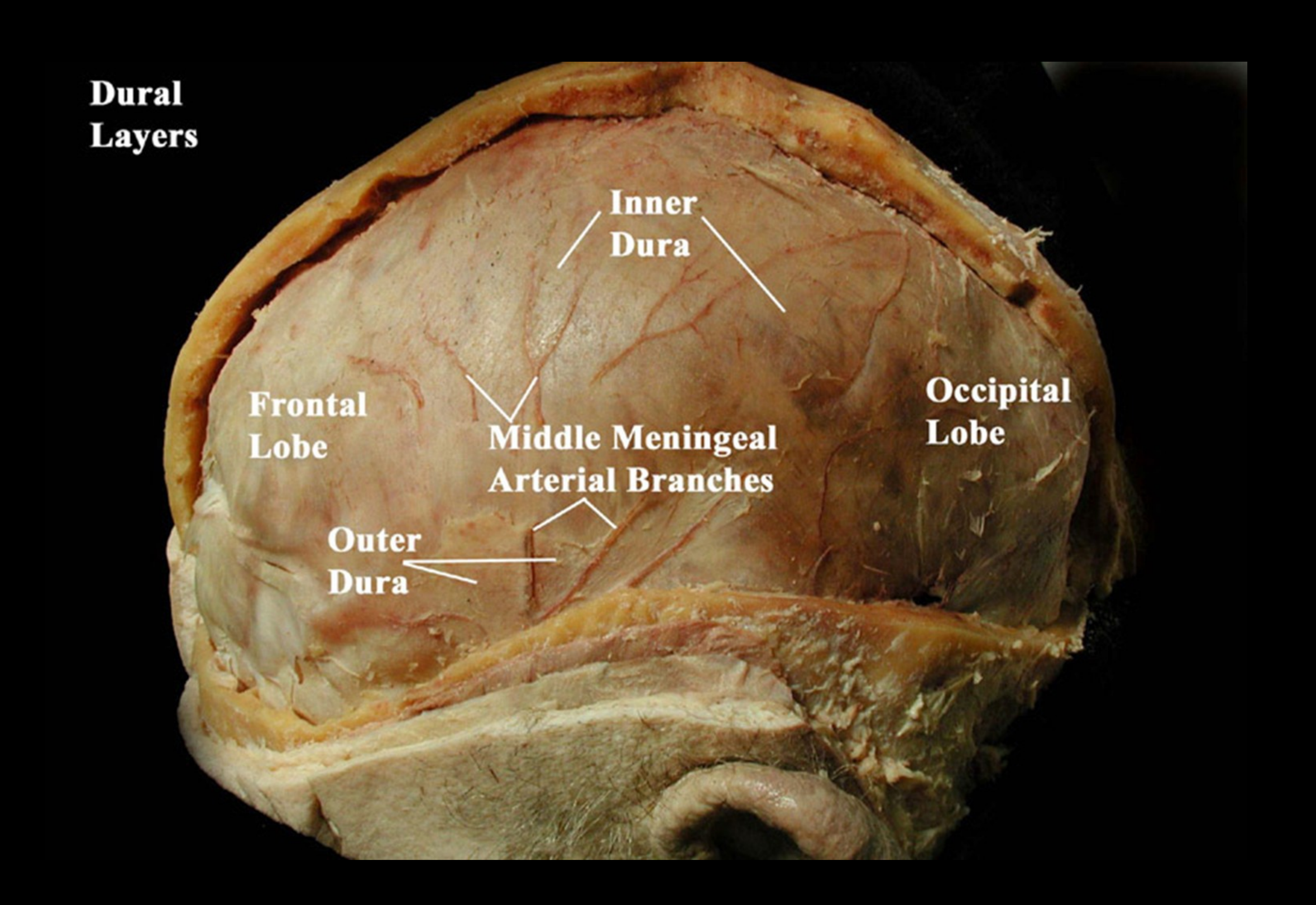
Lecture Quiz

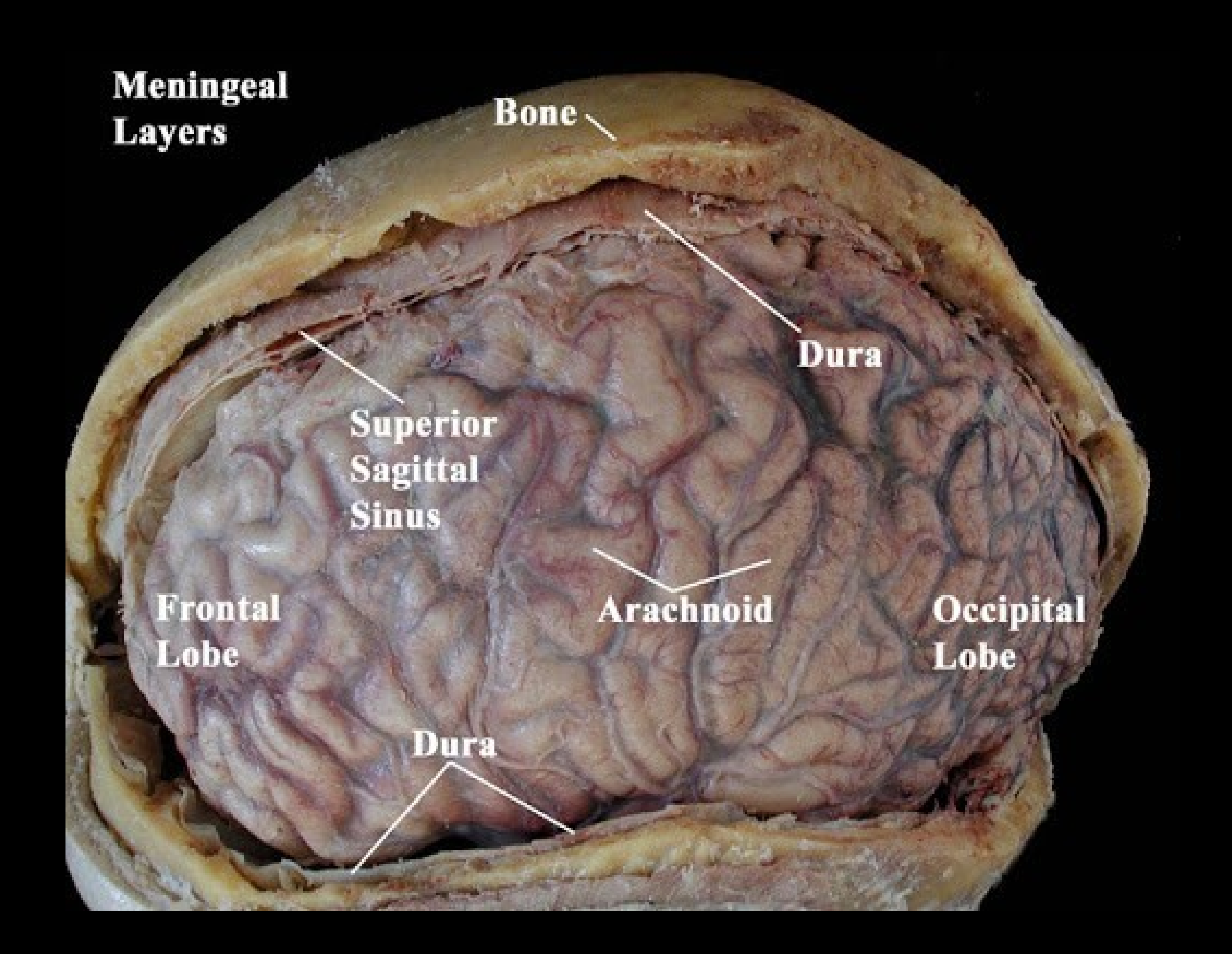


1-Scalp
2-periosteum of skull
3- skull Bone
4- Dura: outer periosteal layer
5- Dura: inner meningeal layer
6- Arachnoid Mater
7- Pia Mater

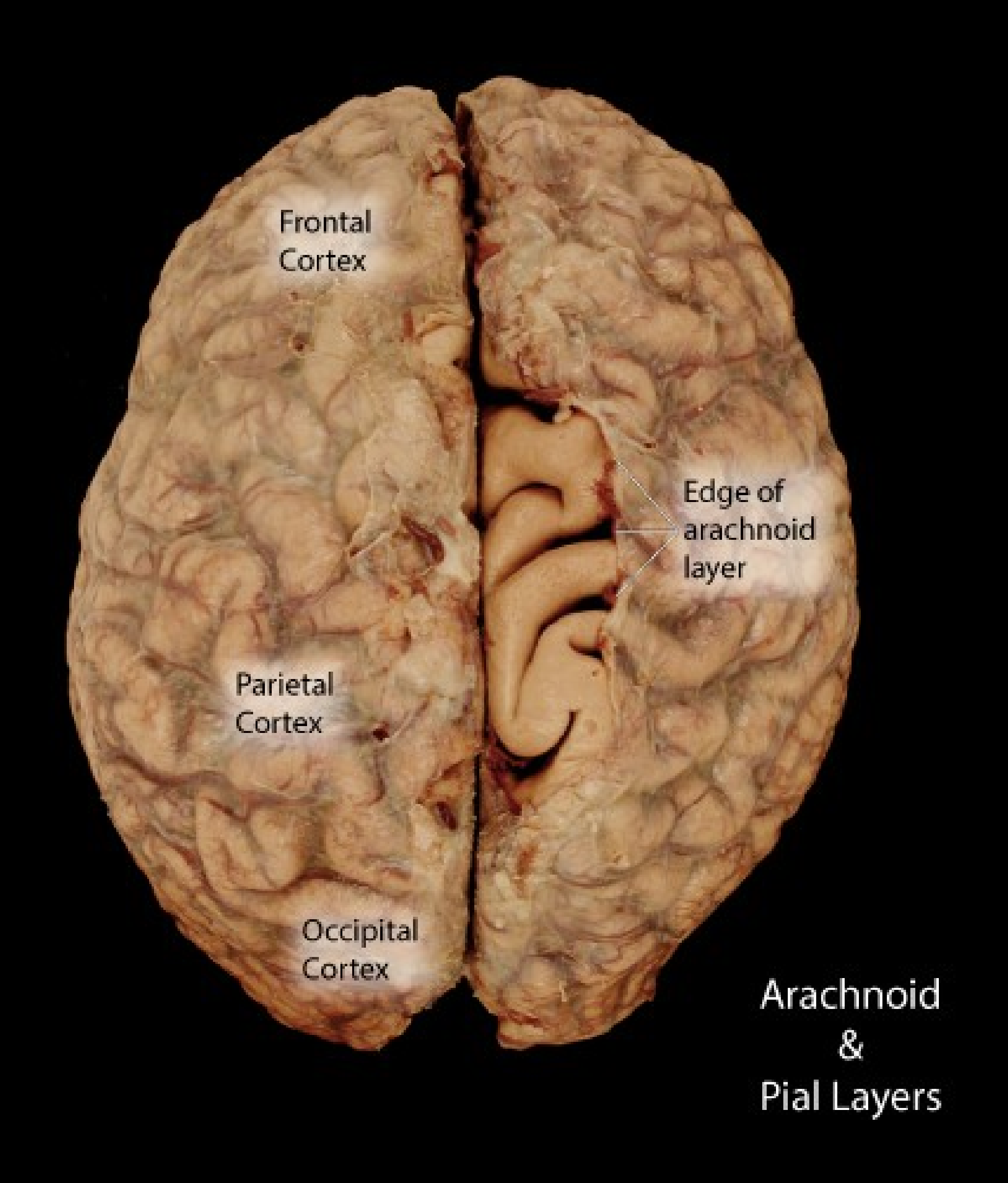


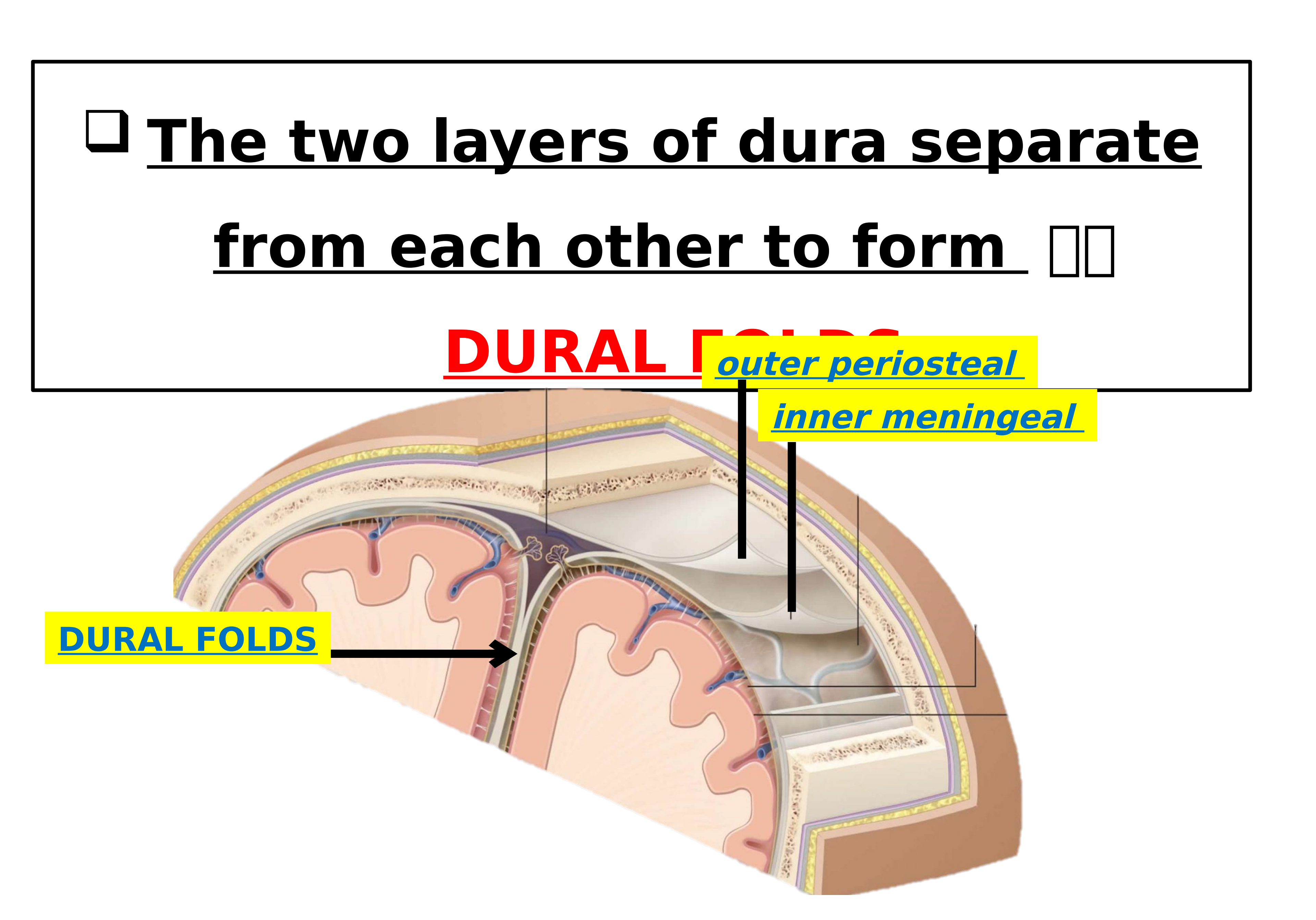



Dural Layers
Inner Dura
Frontal Lobe
Middle Meningeal Arterial Branches
Occipital Lobe
Outer Dura



Meningeal
Layers
Bone
Dura
Superior
Sagittal
Sinus
Frontal
Lobe
Arachnoid
Occipital
Lobe
Dura

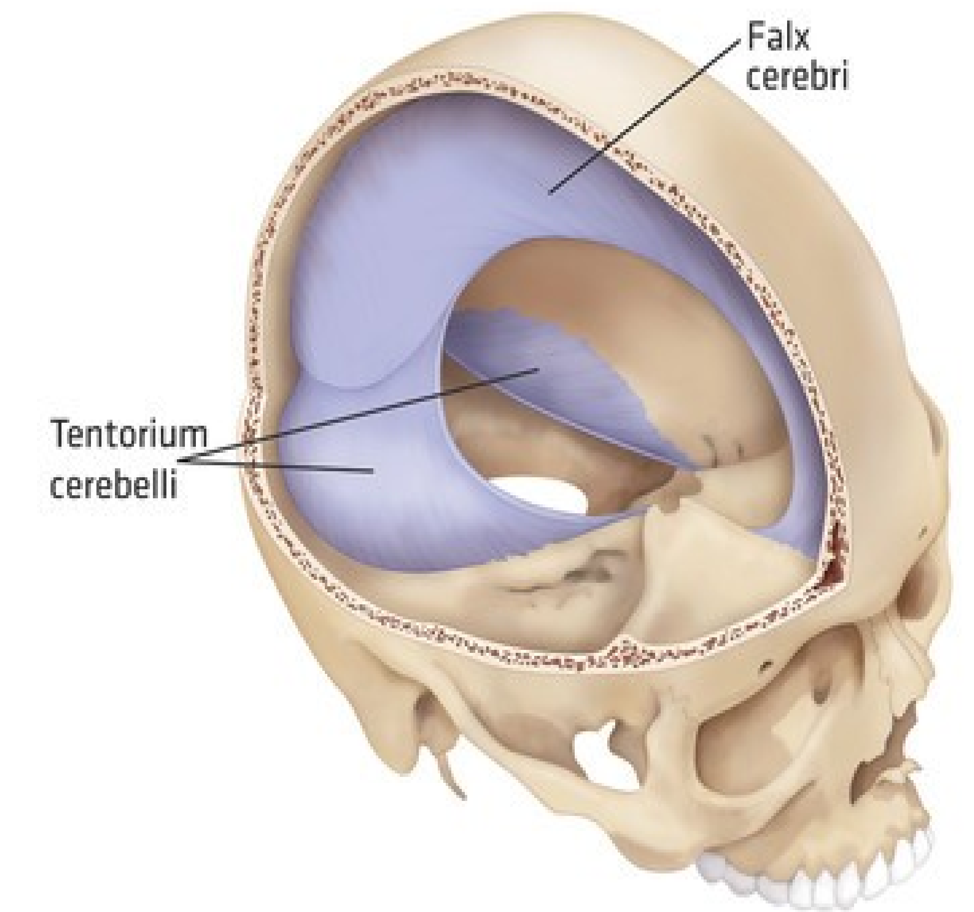

Frontal Cortex
Edge of arachnoid layer
Parietal Cortex
Occipital Cortex
Arachnoid & Pial Layers



❑ The two layers of dura separate from each other to form
DURAL FOLDS
outer periosteal
inner meningeal
DURAL FOLDS

Dural Folds





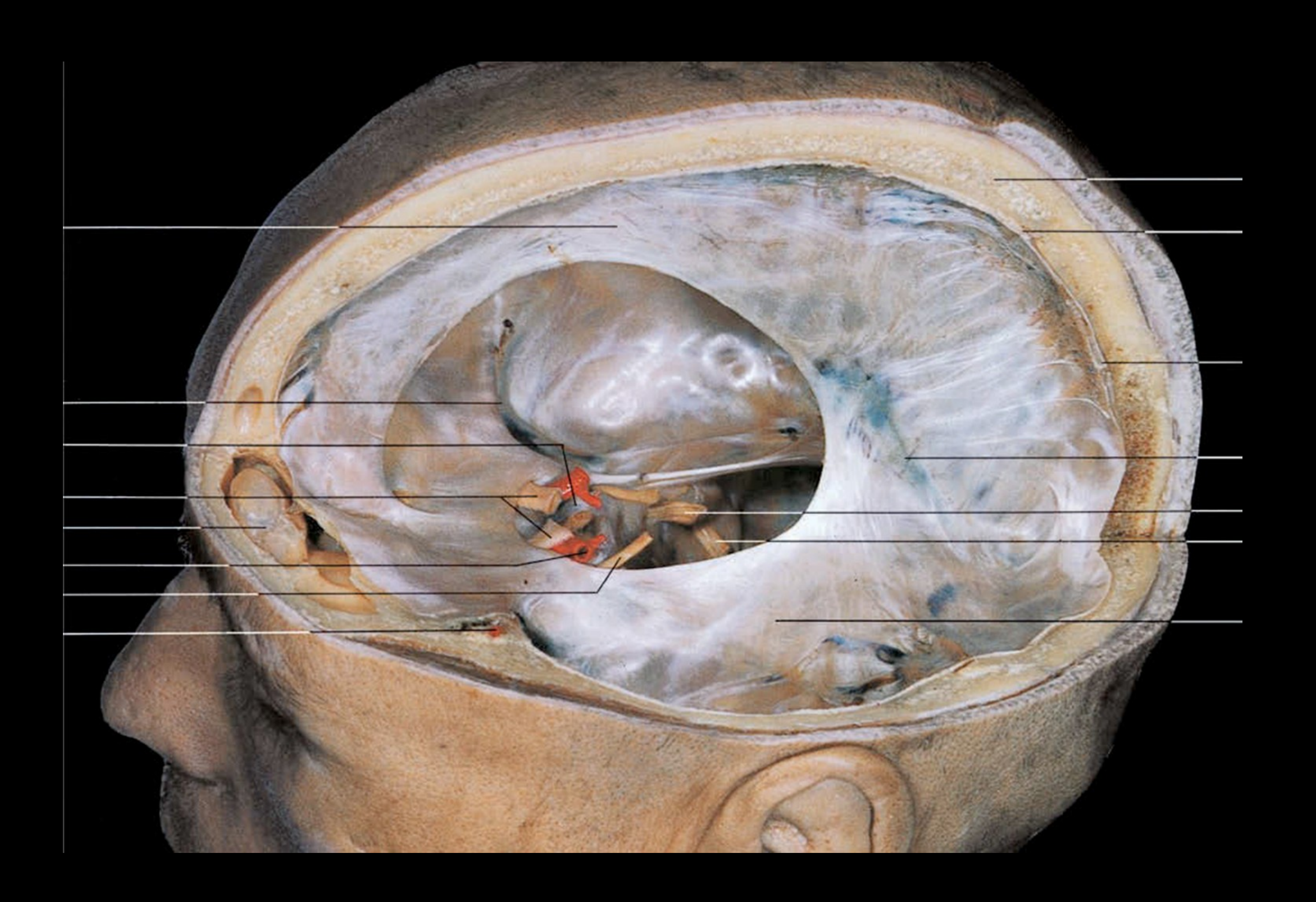
1) Falx Cerebri

2) Tentorium Cerebelli

3) Falx Cerebelli

4) Diaphragma Sellae

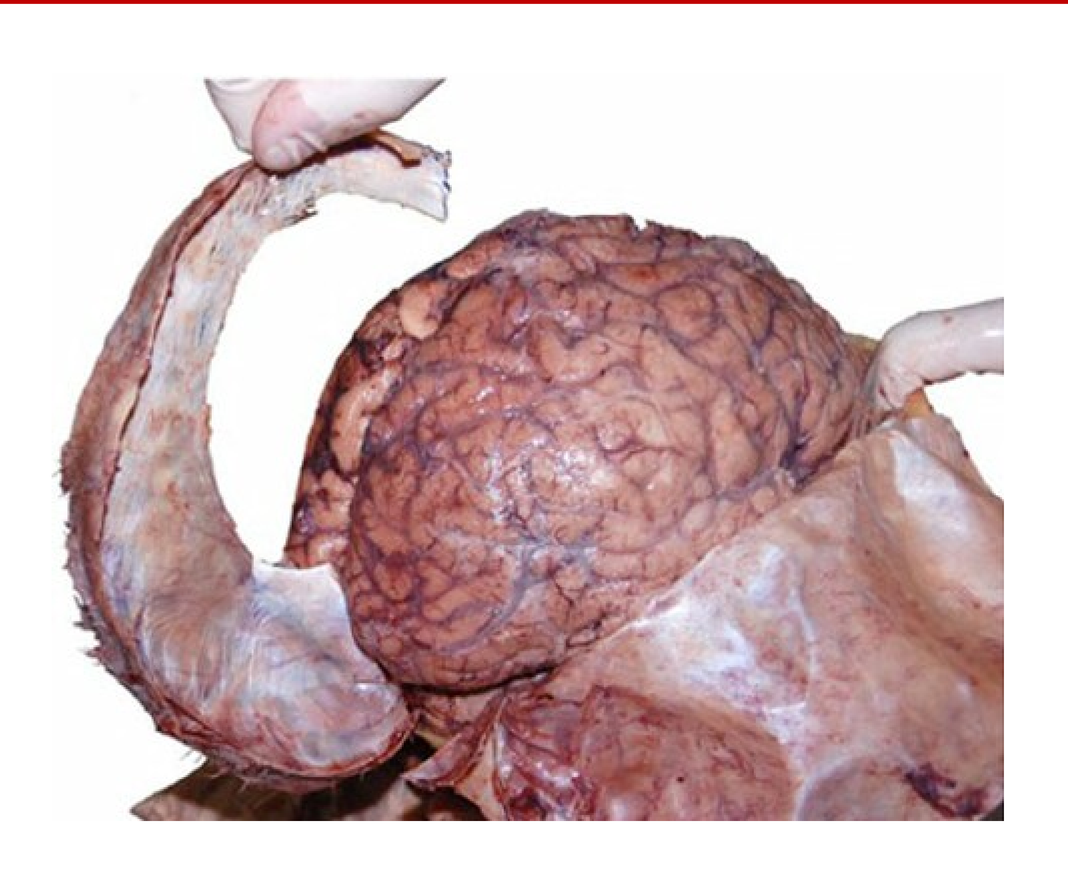
 Function: form **partition-like processes,** between different parts of the brain. They help to **stabilize the brain within the cranial cavity** during movements of head.

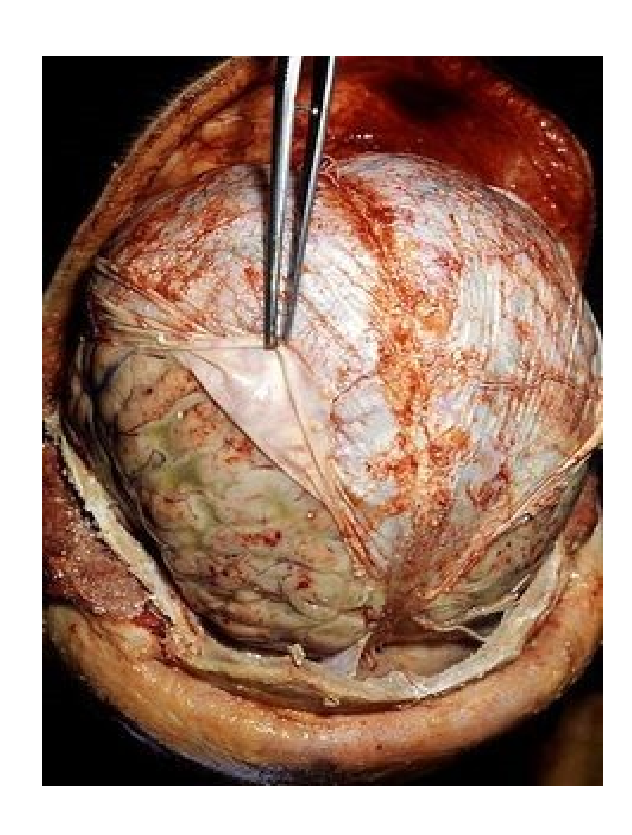


Dural Folds



1- Falx Cerebri





Dural Folds

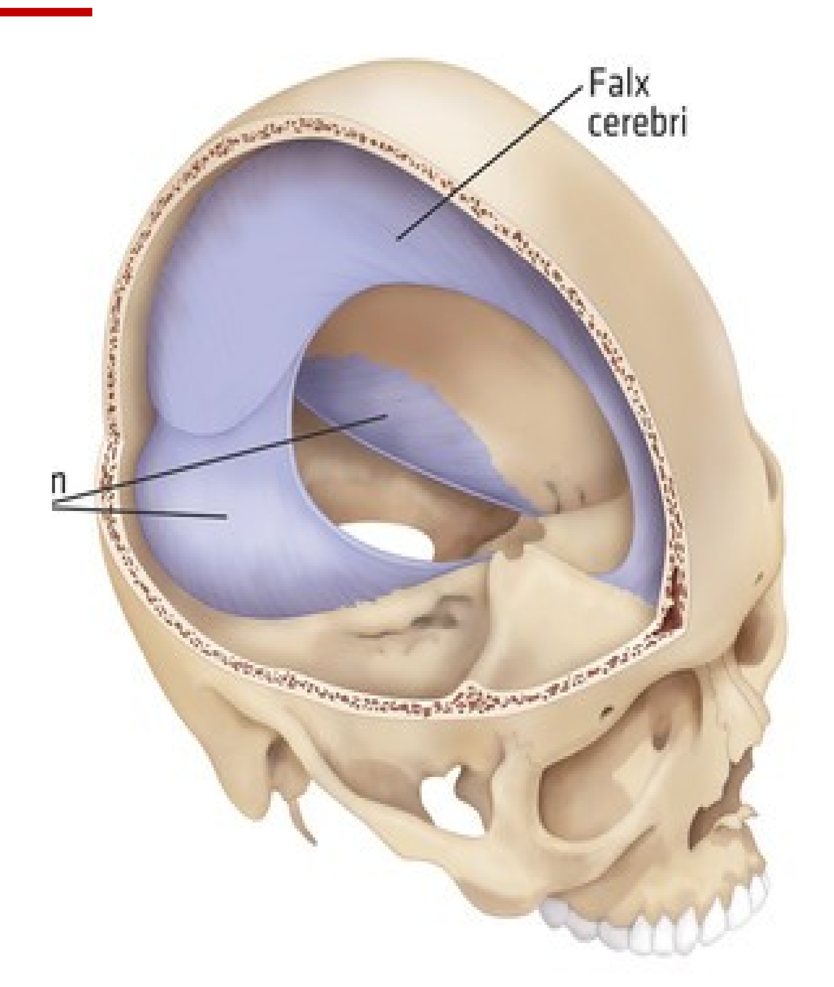


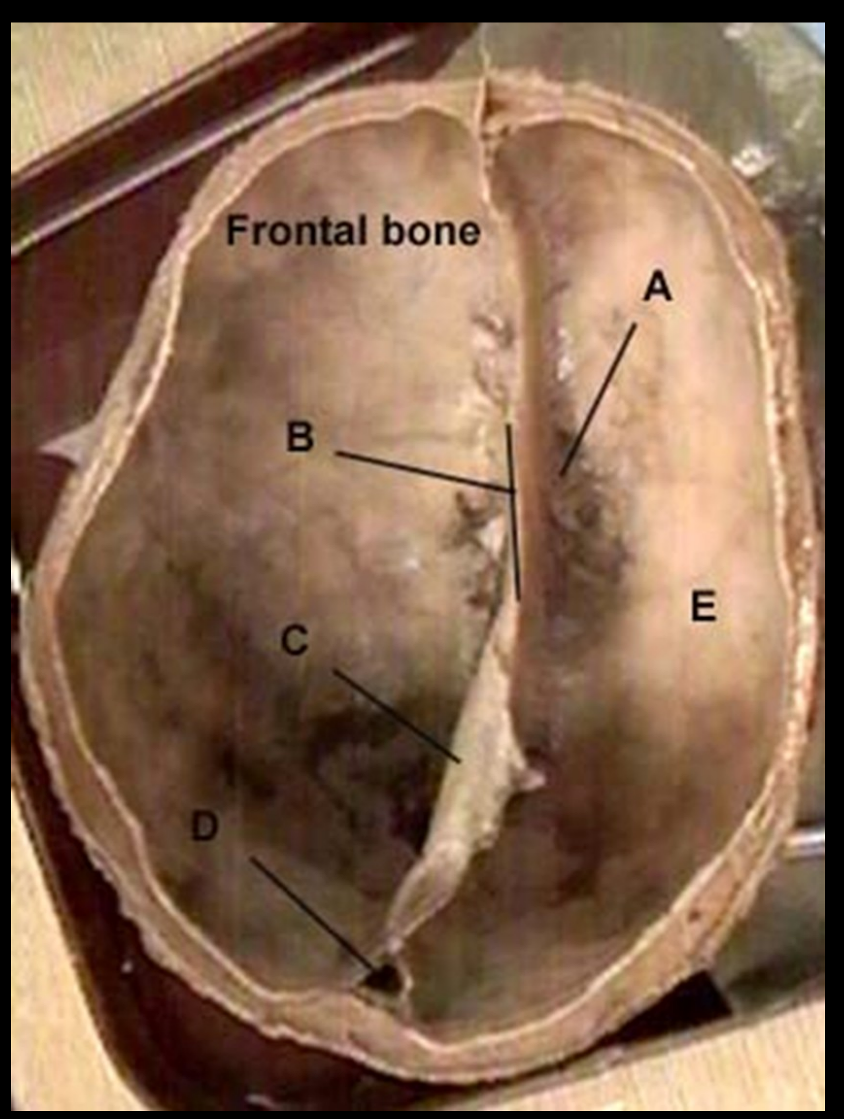
I- Falx Cerebri

- is a *large* ***crescent-shaped***
- projects vertically downward between the ***two cerebral hemispheres***

- **Apex :** It is attached ***anteriorly :***
  - **frontal crest** of the frontal b.
  - **crista galli** of the ethmoid b.

- ***Base :*** it is attached ***Posteriorly*** to upper surface of




Frontal bone
A
B
E
C
D

Dural Folds



I- Falx Cerebri

- <u>The margin of falix enclosing **venous sinusis**</u>

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Upper border
Superior Sagittal Sinus.

Lower free border
Inferior Sagittal Sinus

Base *Straight Sinus.*

Superior

Inferior

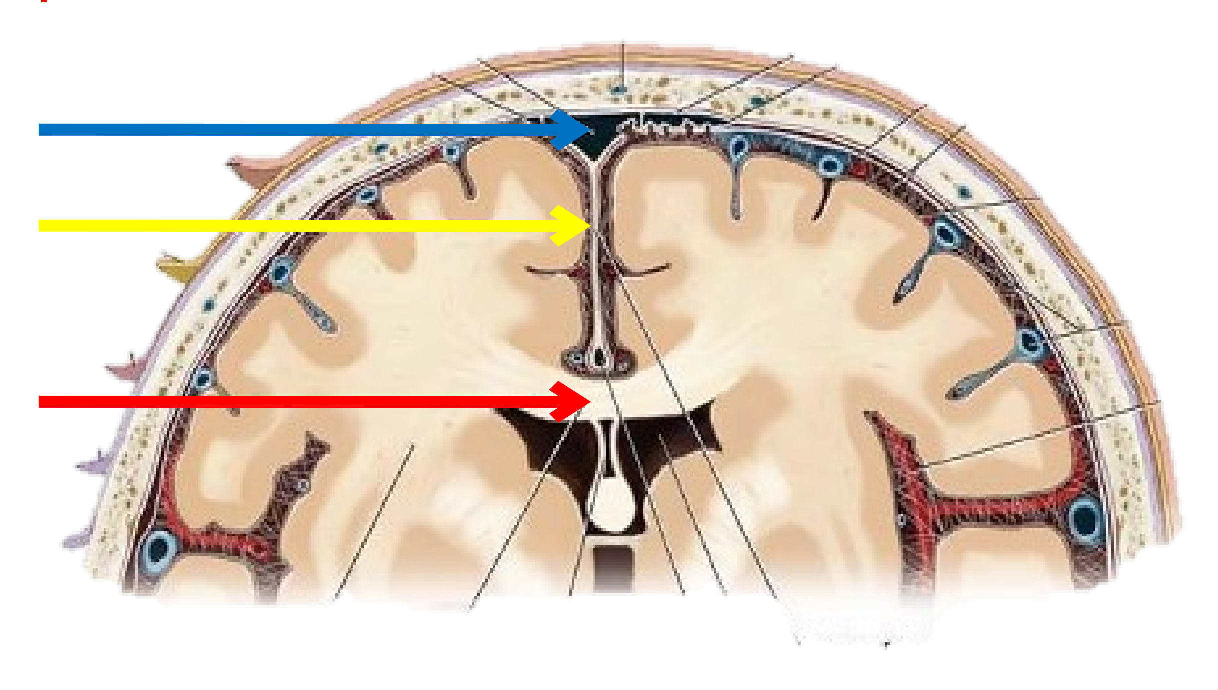
Straight Sinus

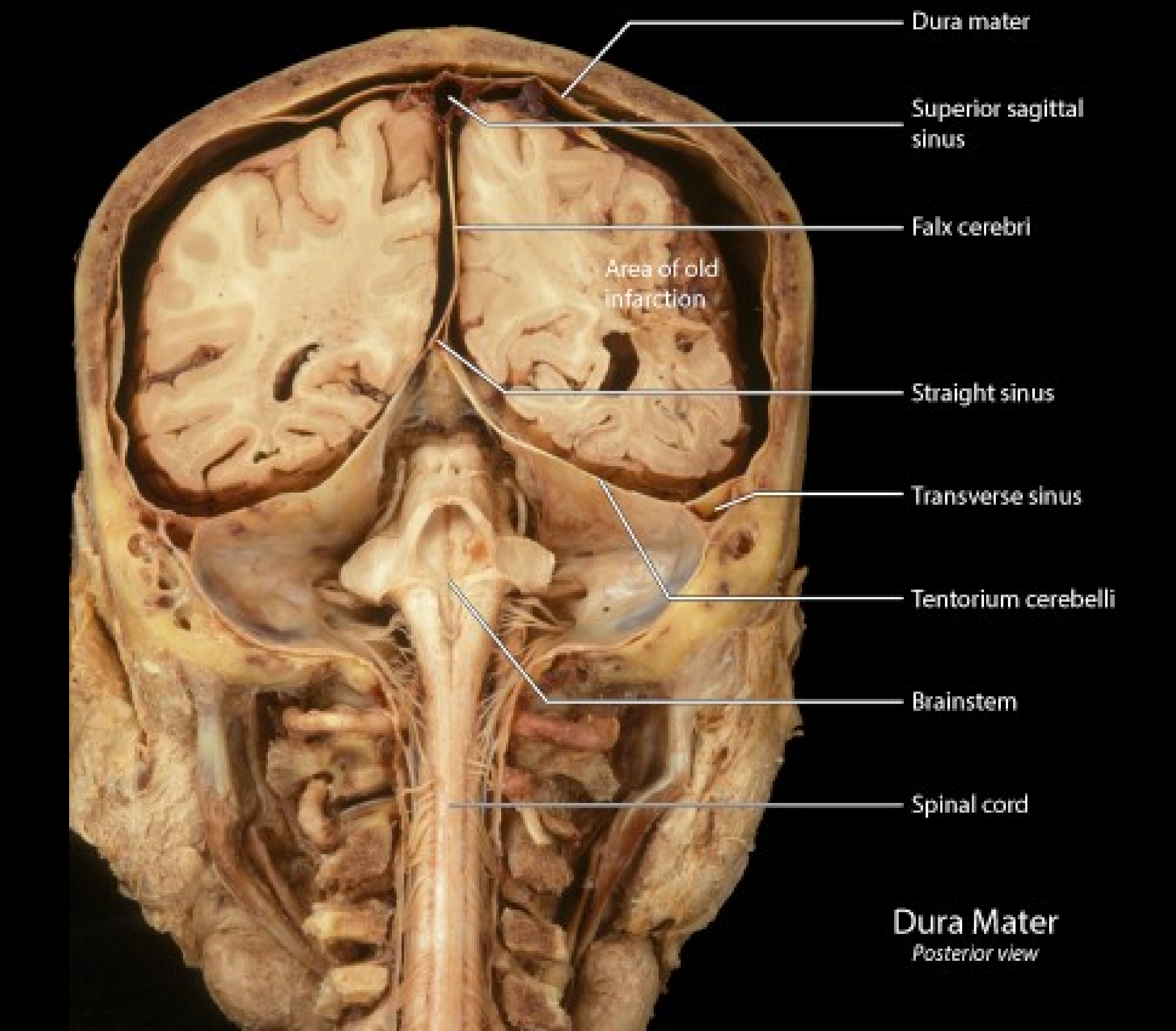


Lecture Quiz



- ✓ Identify the dural fold present in the sagital section?
- ✓ Describe its relation with the nearby cerebral hemisphere?





Dura mater
Superior sagittal sinus
Falx cerebri
Area of old infarction
Straight sinus
Transverse sinus
Tentorium cerebelli
Brainstem
Spinal cord
Dura Mater
Posterior view

Dural Folds

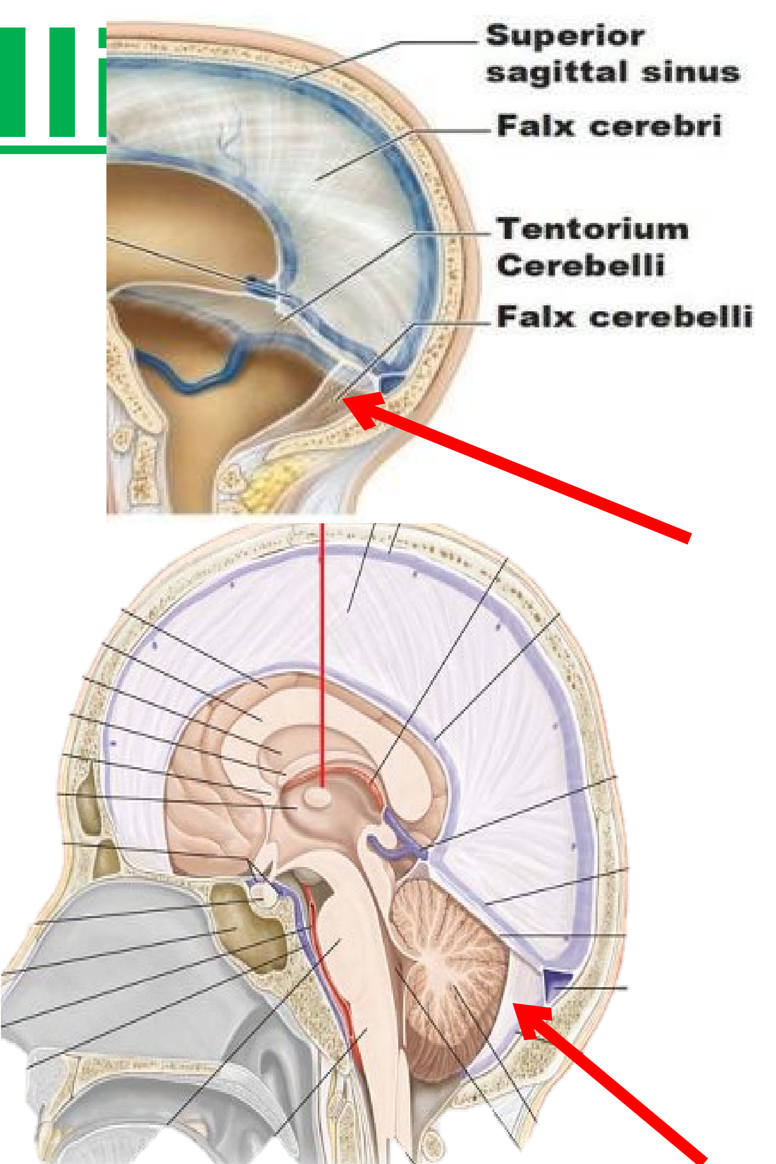


I- Falx Cerebelli

- is a *small* ***crescent-shaped***
- projects vertically downward in *posterior cranial fossa* between the ***two cerebellar hemispheres***

- ***Base :*** it is attached ***(superiorly) lower surface*** of **tentorium cerebelli**

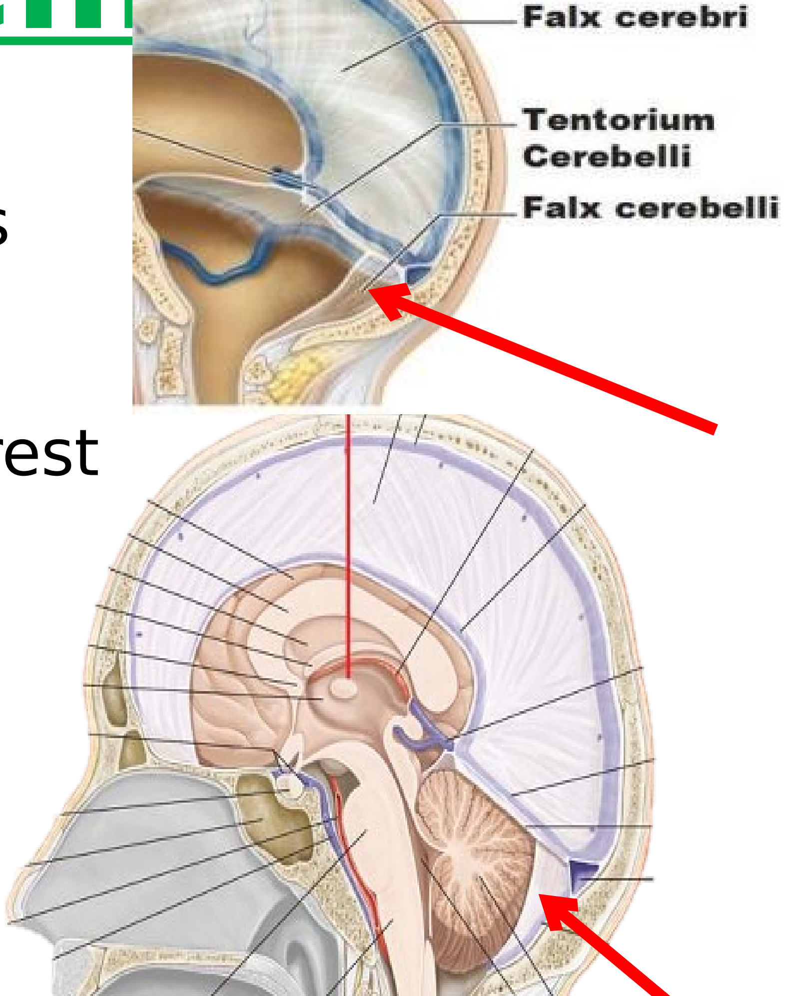
- **Apex :** It is attached ***(inferiorly)*** **the margins of**



Dural Folds



I- Falx Cerebelli



- ***Rt & Lt surfaces***

is related to the cerebellar vermis

- ***Posterior border :***
  - attached to internal occipital crest
  - encloses the ***occipital sinus***

- ***Anterior border :*** free

Dural Folds



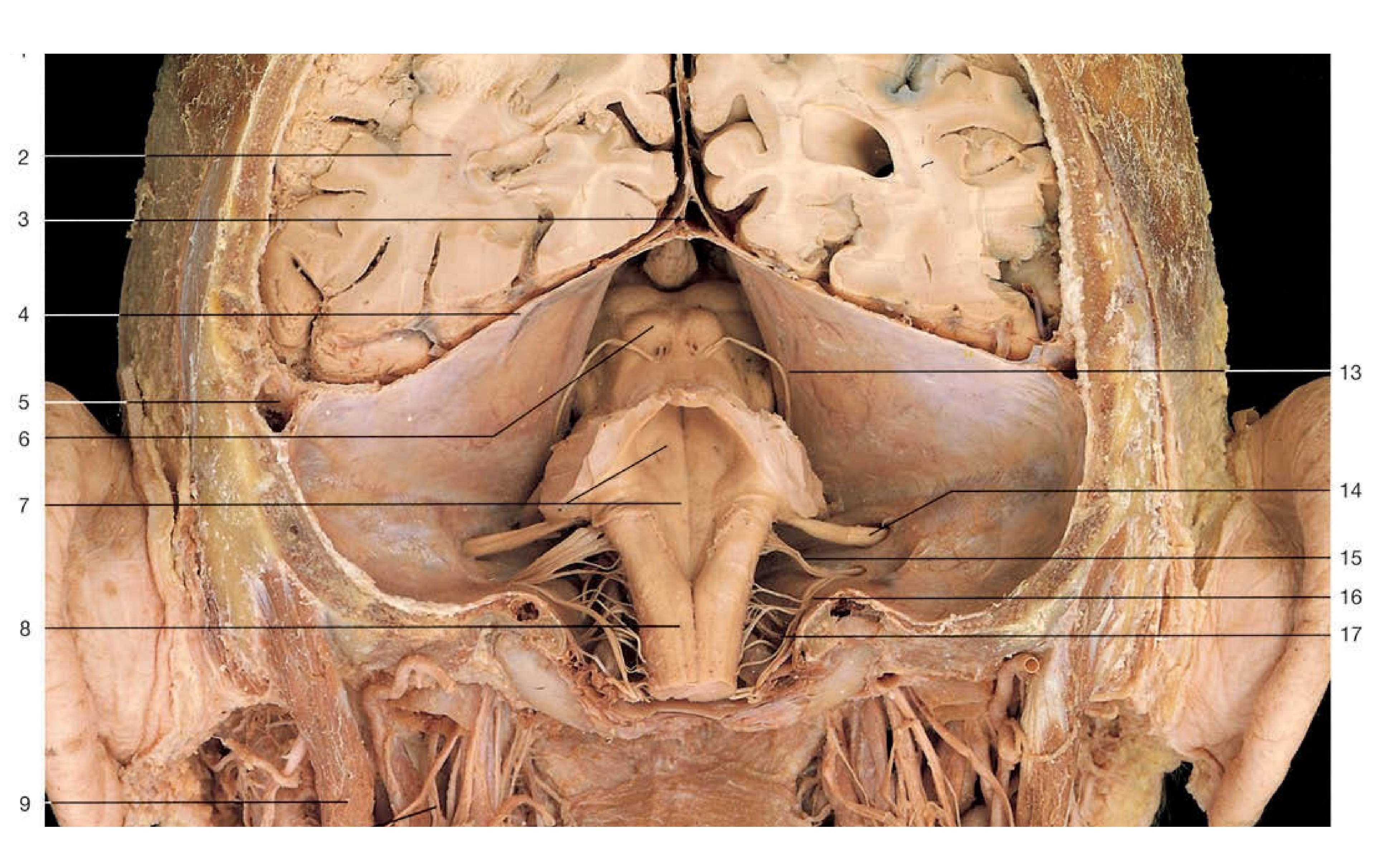
III- Tentorium Cerebelli

- It forms a **horizontal roof** between cerebral and cerebellar hemispheres

- ***Attached border:***
  - transverse sulcus
  - upper border of petrous bone
  - posterior clinoid processes.

- ***Free border:***
  - forming U-shaped tentorial notch between anterior clinoid processes.



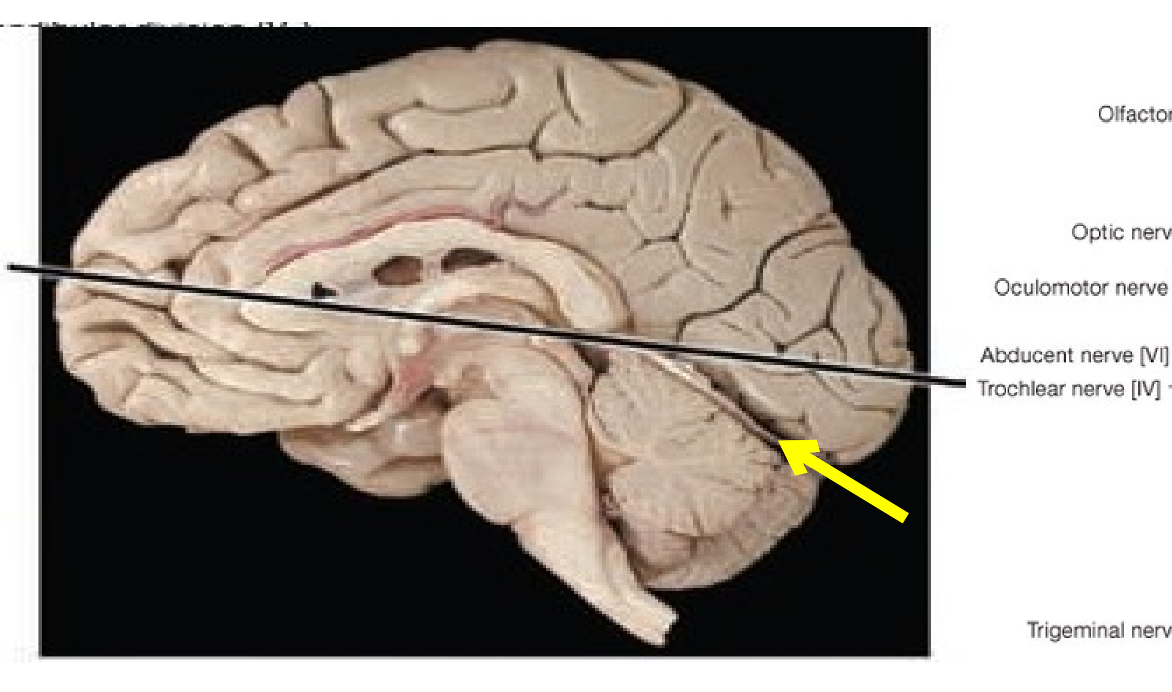

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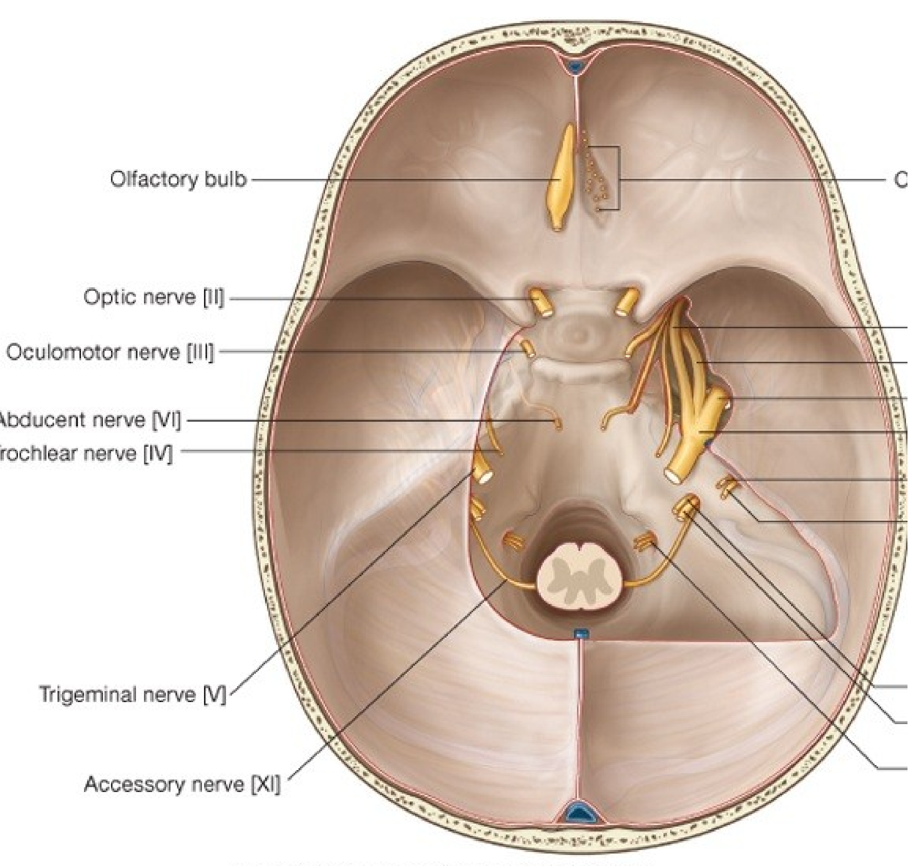

cerebri
Straight sinus
Transverse sinus
Tentorium cerebelli

Lecture Quiz



- ✓ Identify the dural fold present in the medial surface?
- ✓ Describe its relation?

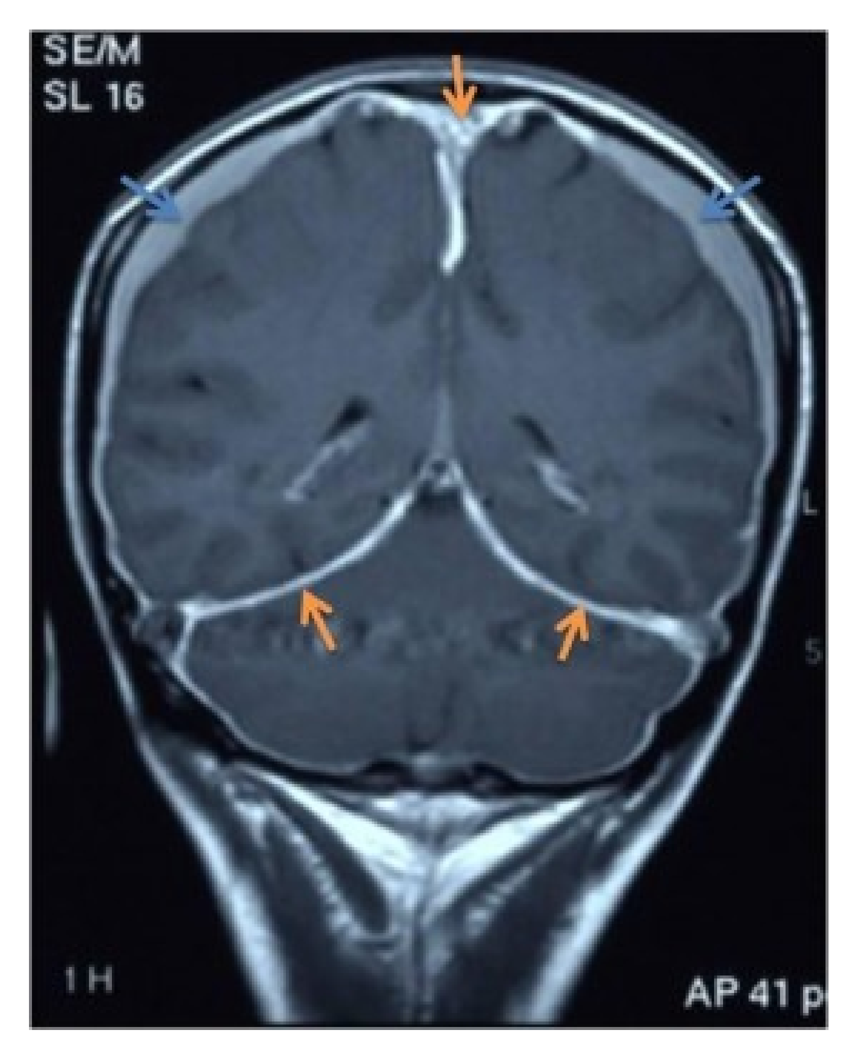




Lecture Quiz



- Identify the dural fold present in the medial surface?
- Describe its relation?

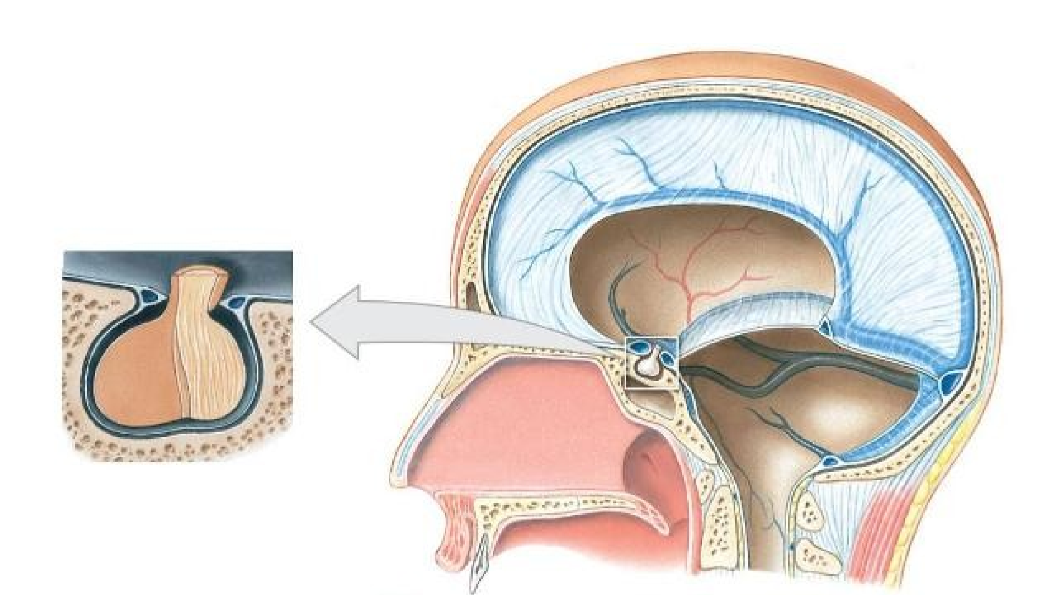


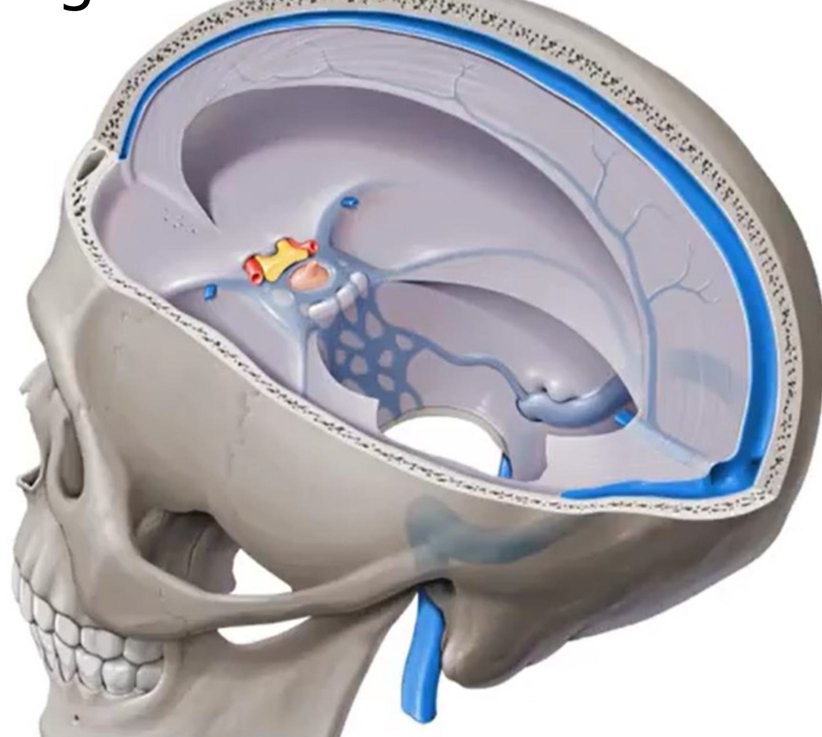
Dural Folds

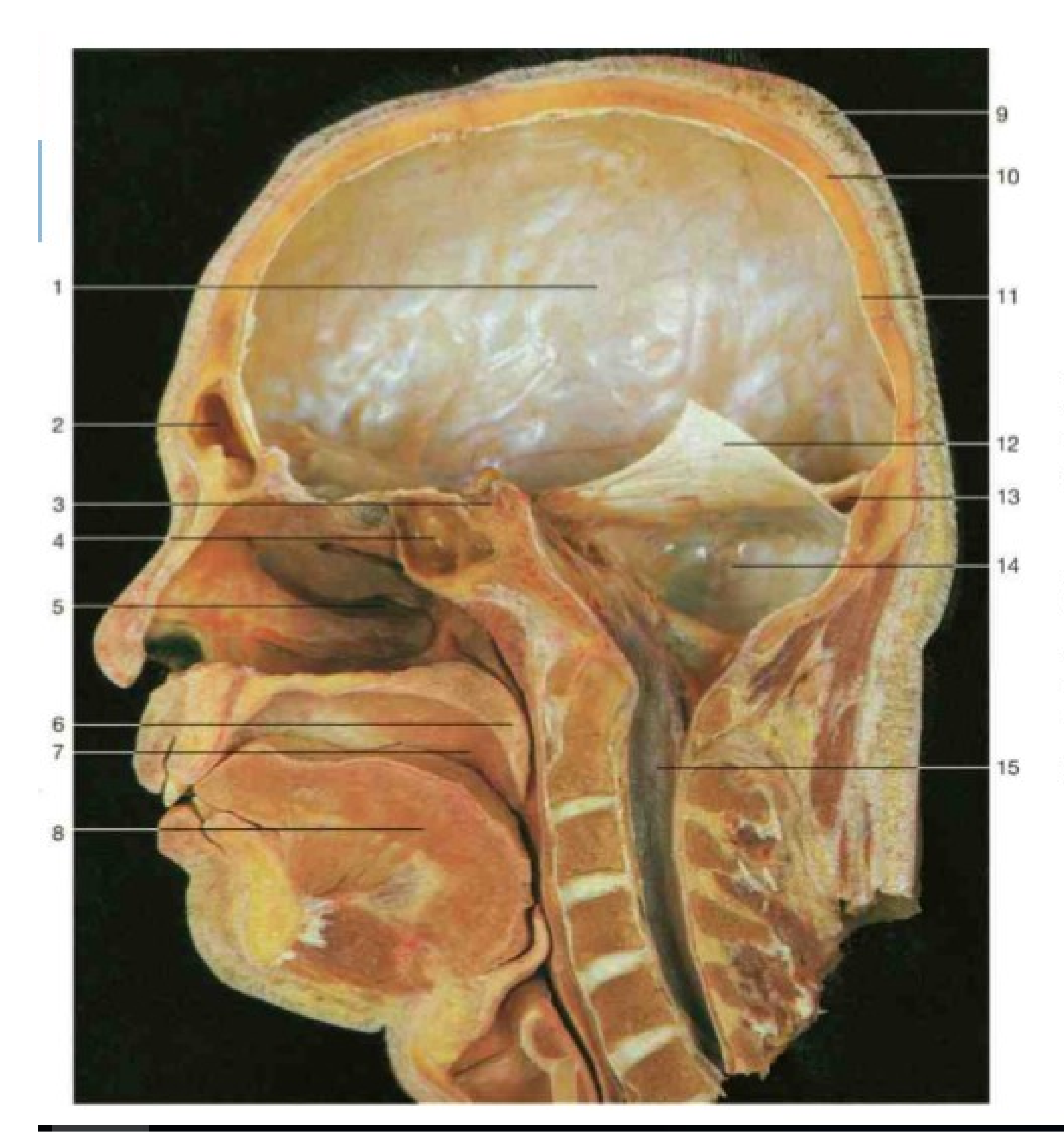


IV- Diaphragma sellae:

- ✓ Is a small dural fold
- ✓ extending between the 4 clinoid processes
- ✓ roofing the ***hypophyseal fossa***.
- ✓ Has a central opening for passage of ***pituitary gland***.





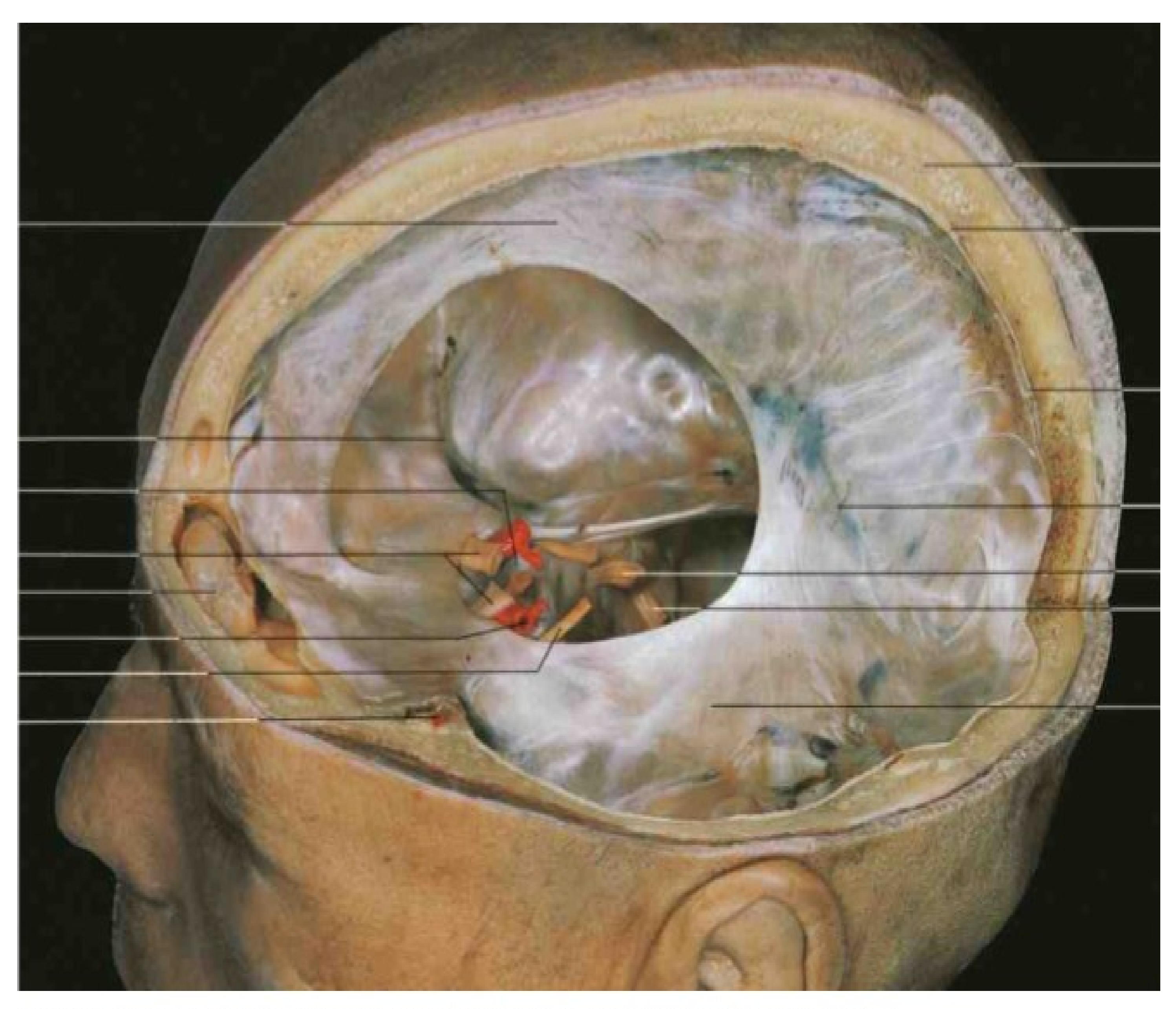


1 Cranial cavity with dura mater (right cerebral hemisphere has been removed)
2 Frontal sinus
3 Hypophysial fossa with pituitary gland
4 Sphenoidal sinus
5 Nasal cavity
6 Soft palate (uvula)
7 Oral cavity
8 Tongue
9 Skin
10 Calvaria
11 Dura mater
12 Tentorium cerebelli
13 Confluence of sinuses
14 Infratentorial space (cerebellum and part of the brain stem have been removed)
15 Vertebral canal
16 Frontal branch of middle meningeal artery and veins
17 Middle meningeal artery
18 Diploe
19 Parietal branch of middle meningeal artery and vein
20 Occipital pole of left hemisphere covered with dura mater

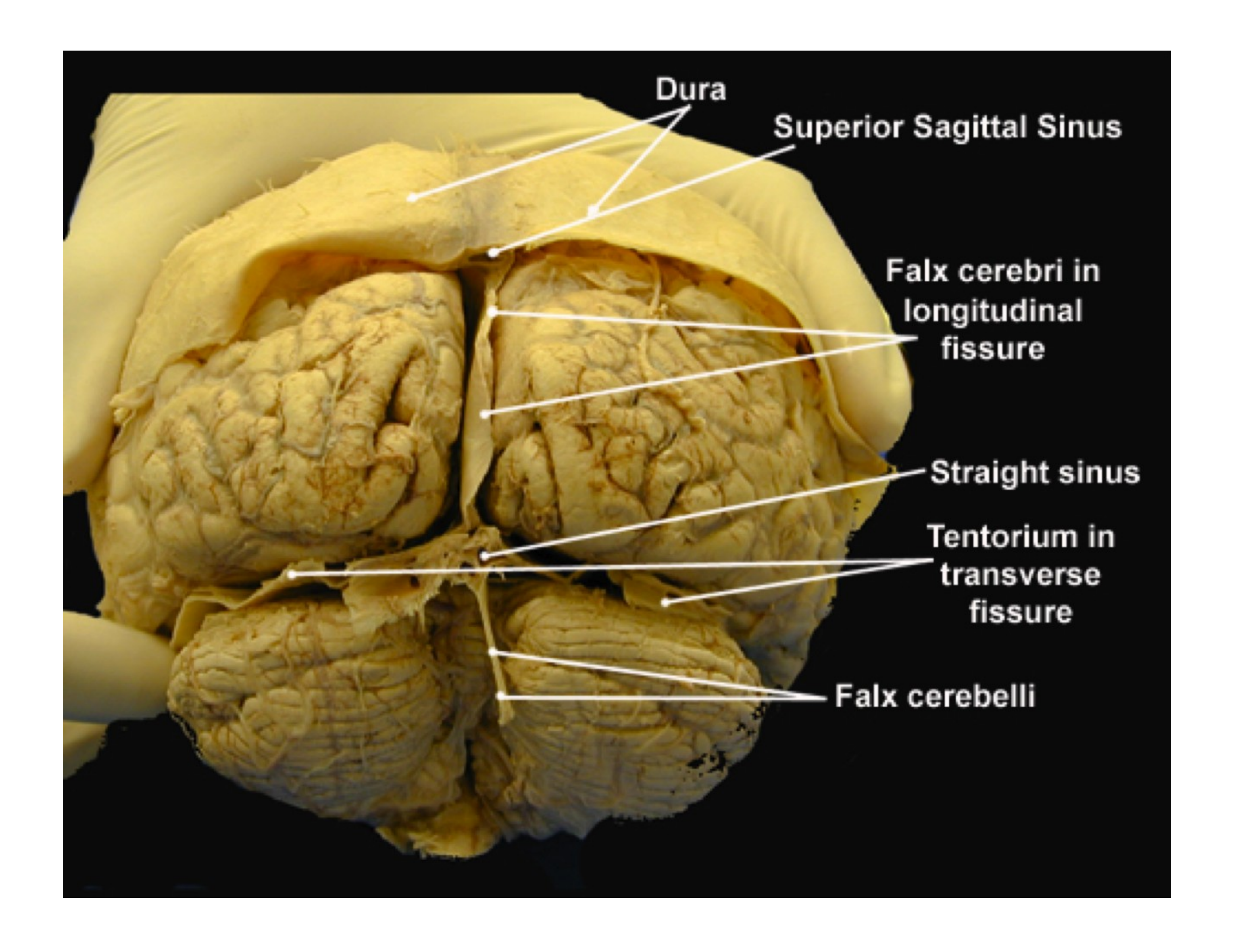
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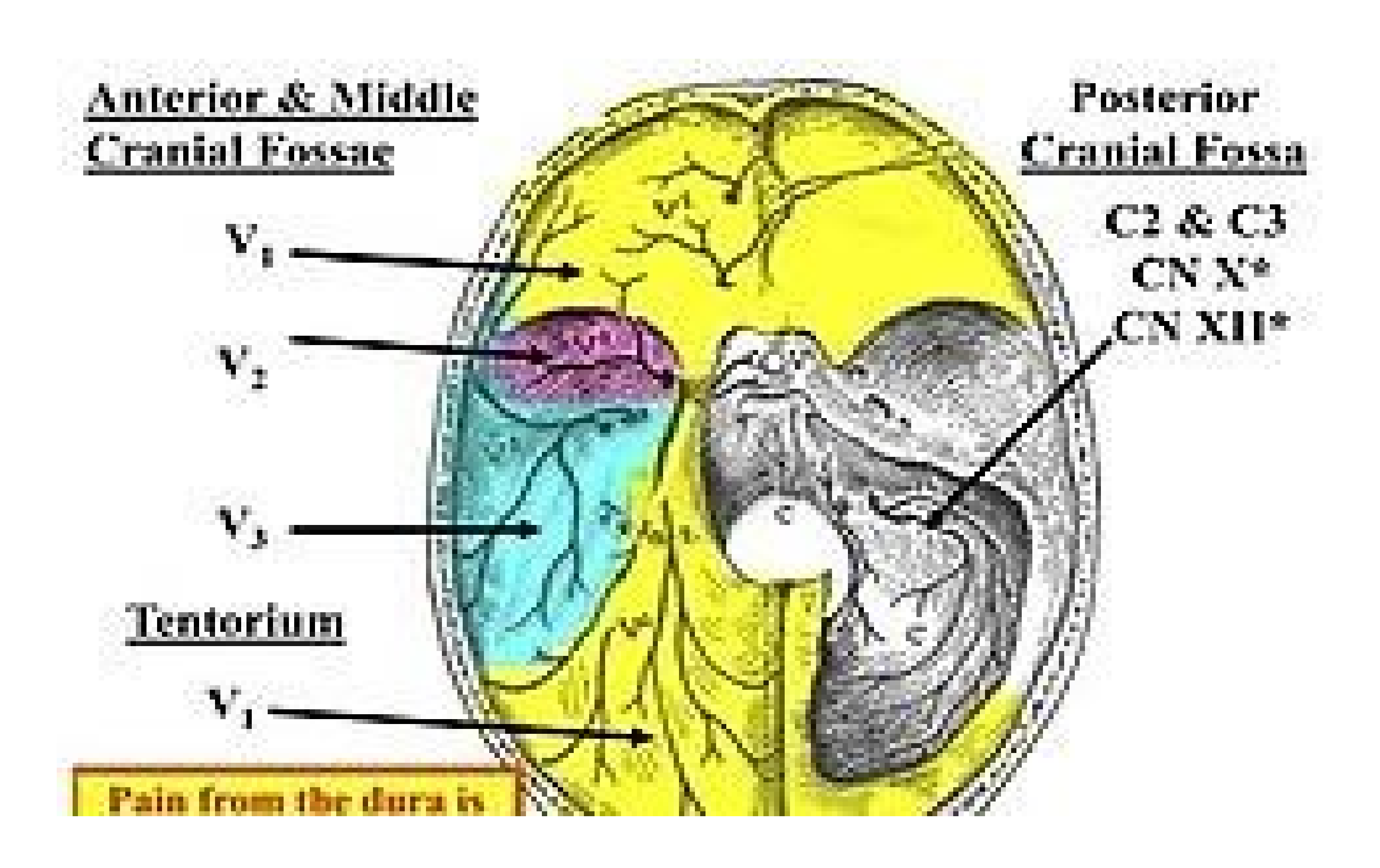


Dura mater and venous sinuses of the dura mater. The brain has been removed (oblique lateral aspect).


Dura
Superior Sagittal Sinus
Falx cerebri in longitudinal fissure
Straight sinus
Tentorium in transverse fissure
Falx cerebelli

	1- Falx cerebri	***2- Falx cerebelli***	***3- Tentorium cerebelli***
Shape	large sickle-shaped	small sickle-shaped	Tent-shaped
Site	present **vertically** along the median fissure between the 2 cerebral hemispheres.	present **vertically** in the posterior cranial fossa between the 2 cerebellar hemispheres.	forms a **horizontal** roof for the posterior cranial fossa between cerebral and cerebellar hemispheres.
Attachments	- <u>*Apex (anteriorly):*</u> attached to crista galli + frontal crest. -<u>*Base (posteriorly):*</u> attached to upper surface of tentorium cerebelli *enclosing the straight sinus*. - <u>*Upper border*</u> (to lips of sagittal sulcus *enclosing sup. sagittal sinus.* <u>*- Lower free border*</u> (concave) *encloses inf. sagittal sinus*	- <u>*Base (superiorly):*</u> attached to tentorium cerebelli. - <u>*Apex (inferiorly):*</u> narrow, attached to the margins of the foramen magnum - <u>*Posterior border*</u> attached (to internal occipital crest) *encloses the occipital sinus.* - <u>*Anterior border*</u> <u>*(free)*</u>	- <u>*Attached border*</u> to lips of transverse sulcus + upper border of petrous bone posterior clinoid processes,. -<u>*Free border*</u> forming U-shaped <u>*tentorial notch*</u> between anterior clinoid processes, for passage of midbrain.

Nerve supply of the dura mater



Nerve supply of the dura mat

Nerve supply of dura:

Mainly by 3 divisions of trigeminal + upper 3 cervical nerves + sympathetic nerves.

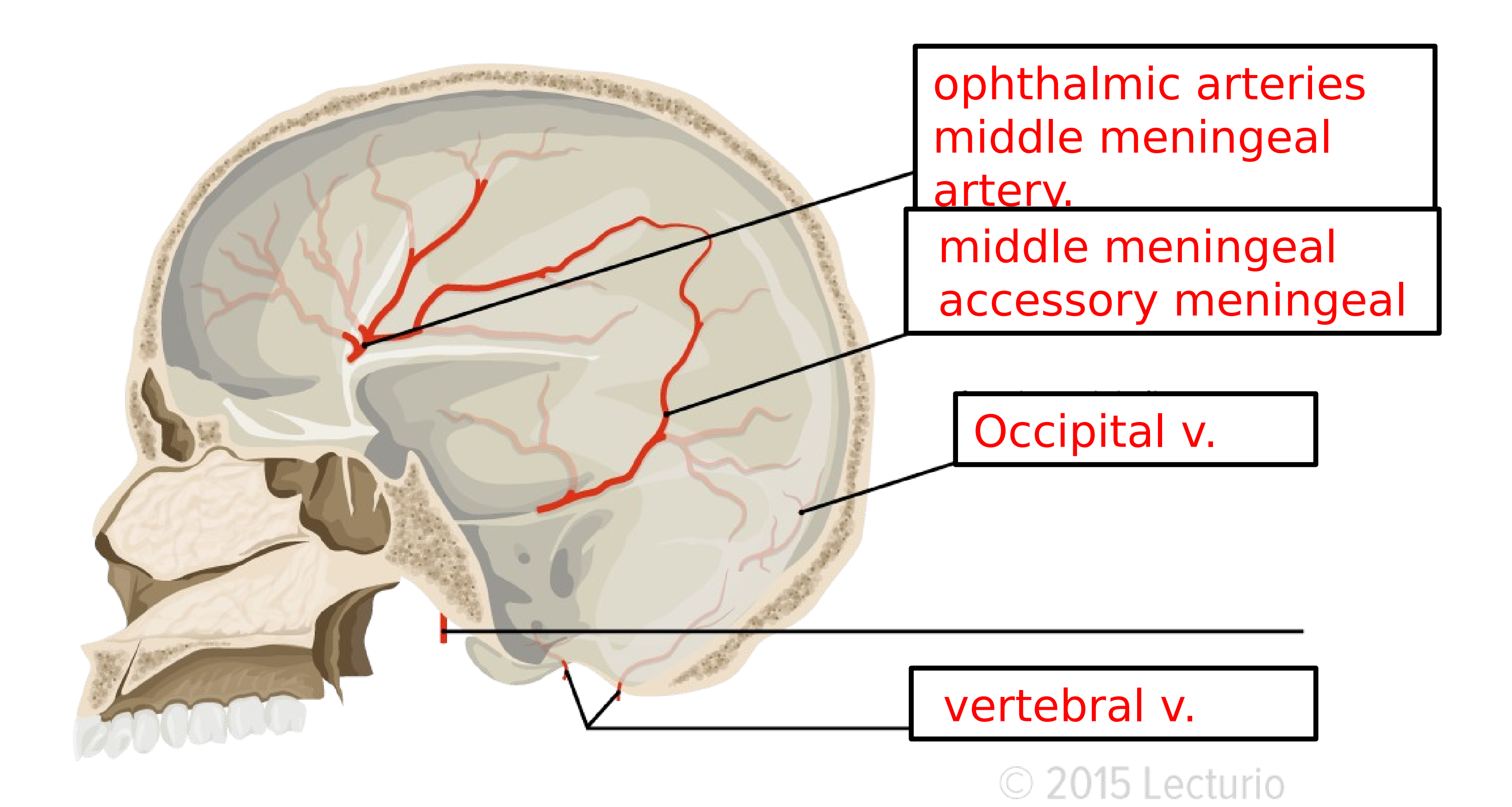
a. ***Ant. cranial fossa*** by ant. ethmoidal *n.* *mainly* + maxillary *n.* *partly*.

b. ***Middle cranial fossa*** by maxillary *n.* *in ant.1/2* + mandibular *n.* *in post 1/2*.

c. ***Posterior cranial fossa*** by meningeal branches of 10th & 12th ns. + Recurrent branches of *C1,2,3 ns*.

The recurrent tentorial branch supplies the tentorium cerebelli.

Blood supply of the dura mater



Blood supply of the dura mater

Blood supply of dura:

-The outer layer is more vascular than the inner layer.

- Is supplied as follows:

a. *Anterior cranial fossa* by meningeal branches of anterior & posterior ethmoidal of ophthalmic arteries + middle meningeal artery.

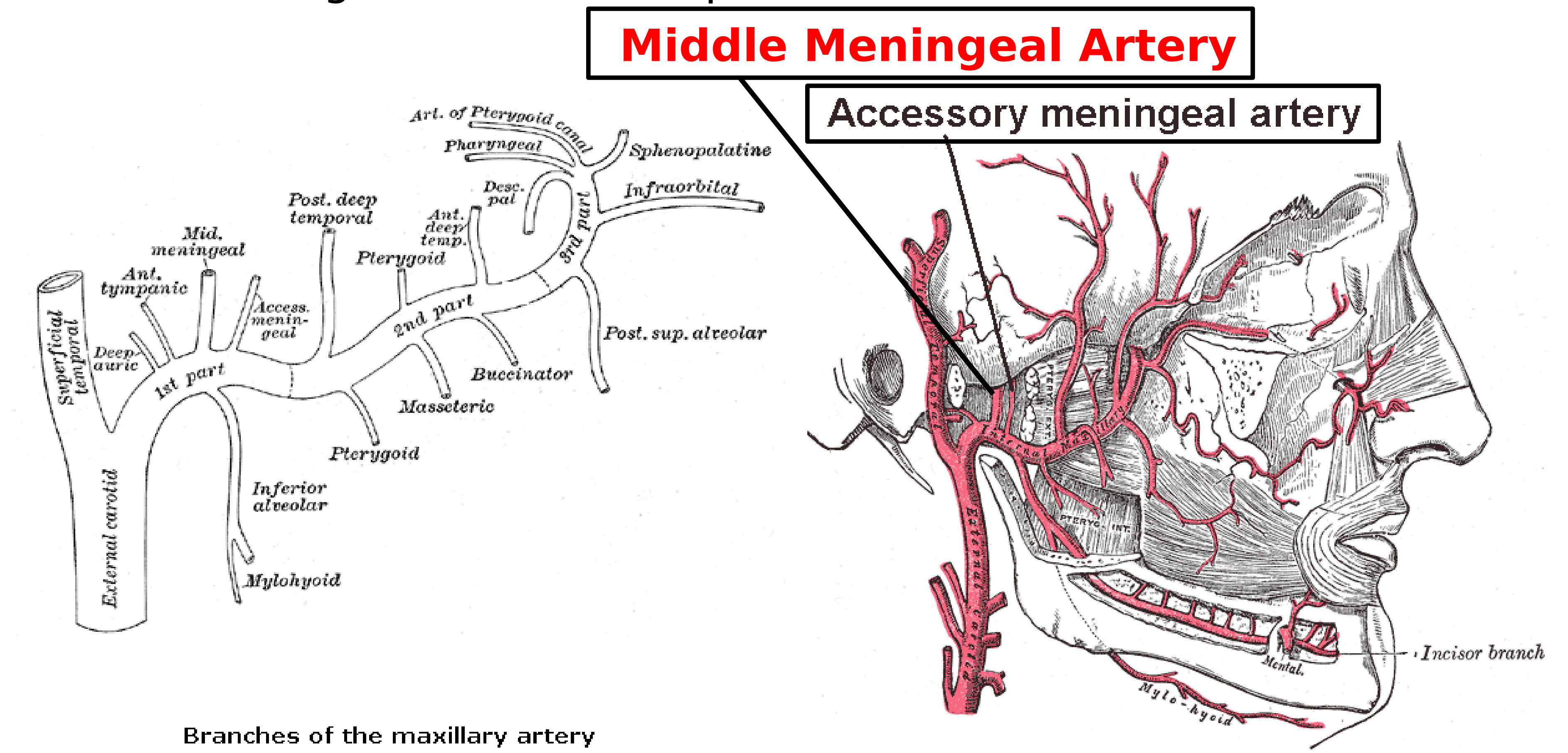
b. *Middle cranial fossa* by middle & accessory meningeal + ascending pharyngeal arteries.

c. *Posterior cranial fossa* by meningeal branches of vertebral, occipital & ascending pharyngeal arteries.

Middle Meningeal Artery

 Origin: from the first part of maxillary artery

 Course: Runs upwards to enter the middle cranial fossa through the foramen spinosum.



Branches of the maxillary artery

Middle Meningeal Artery

- **In the middle cranial fossa,** it runs between the two layers of the dura. the artery grooves the squamous part of temporal bone

- It divides into
  I. **frontal branch.**
  II. **parietal branch.**

- **It supplies**
  1. dura mater only small branches
  2. a periosteal artery supplying skull bones is predominantly

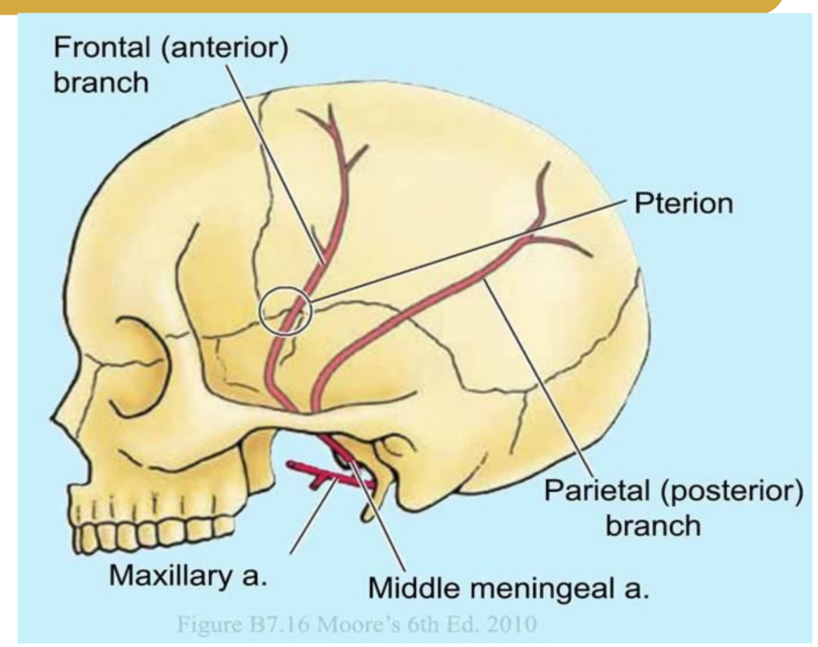
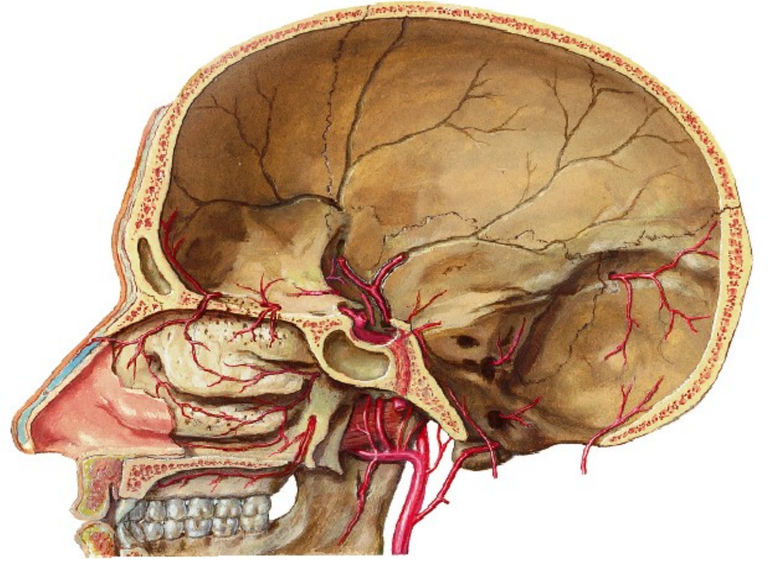
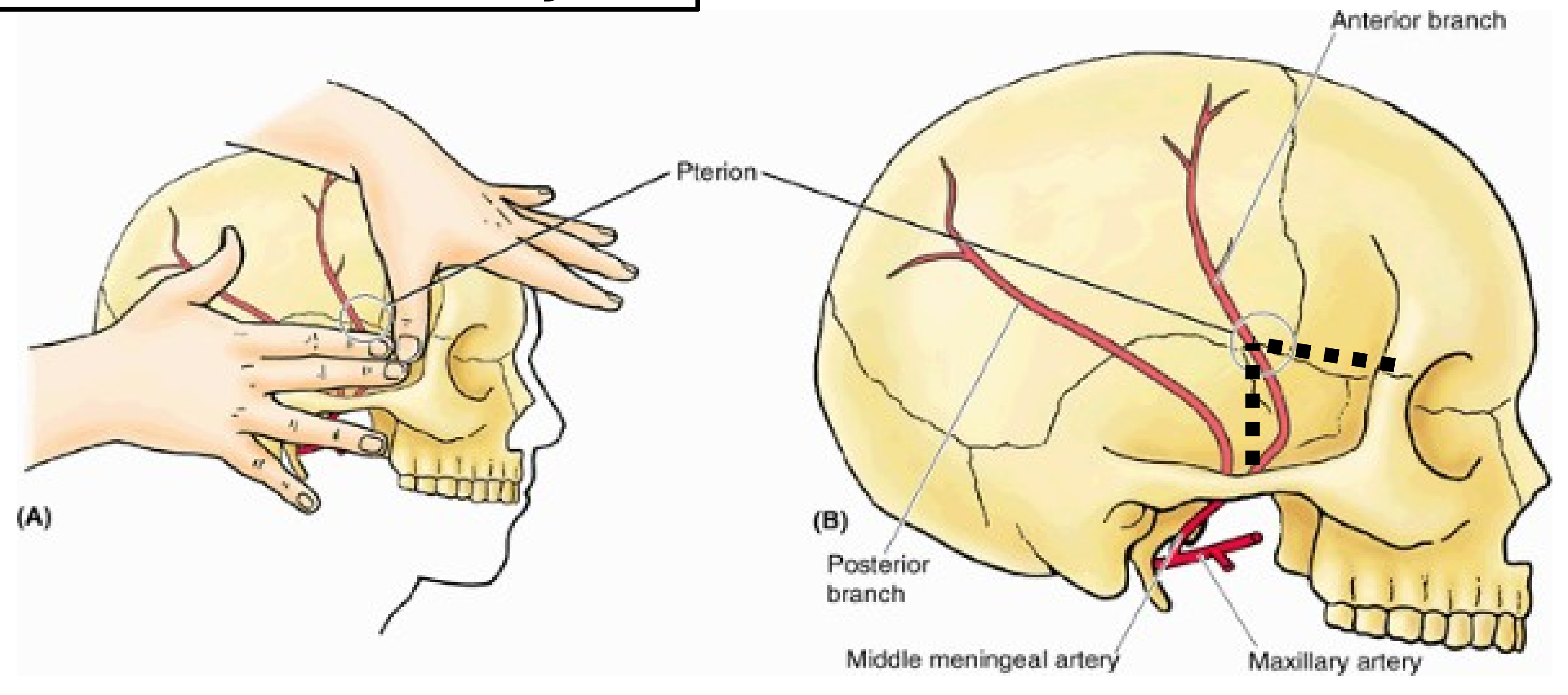


Figure B7.16 Moore's 6th Ed. 2010



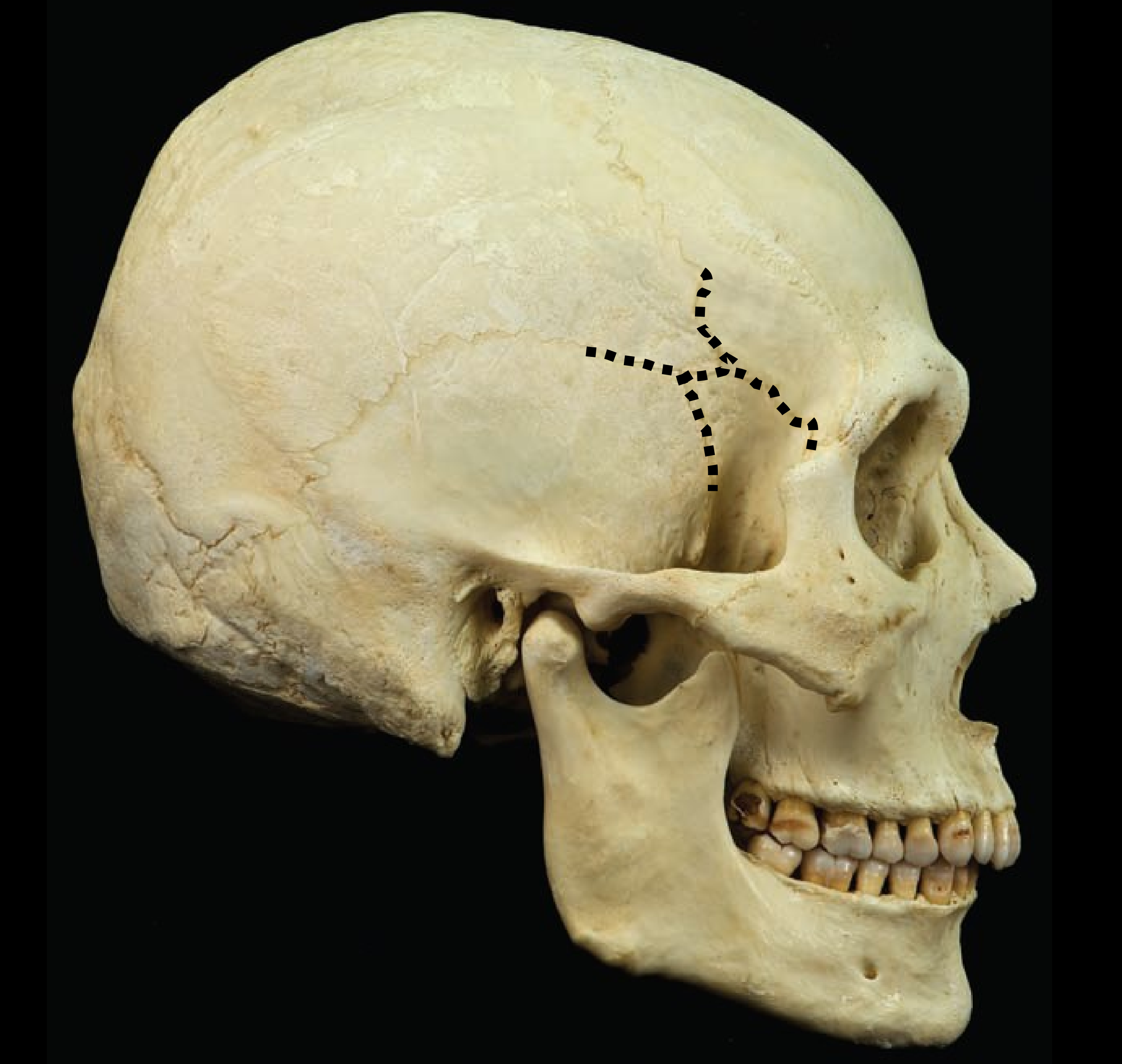
Middle Meningeal Artery

Surface Anatomy:

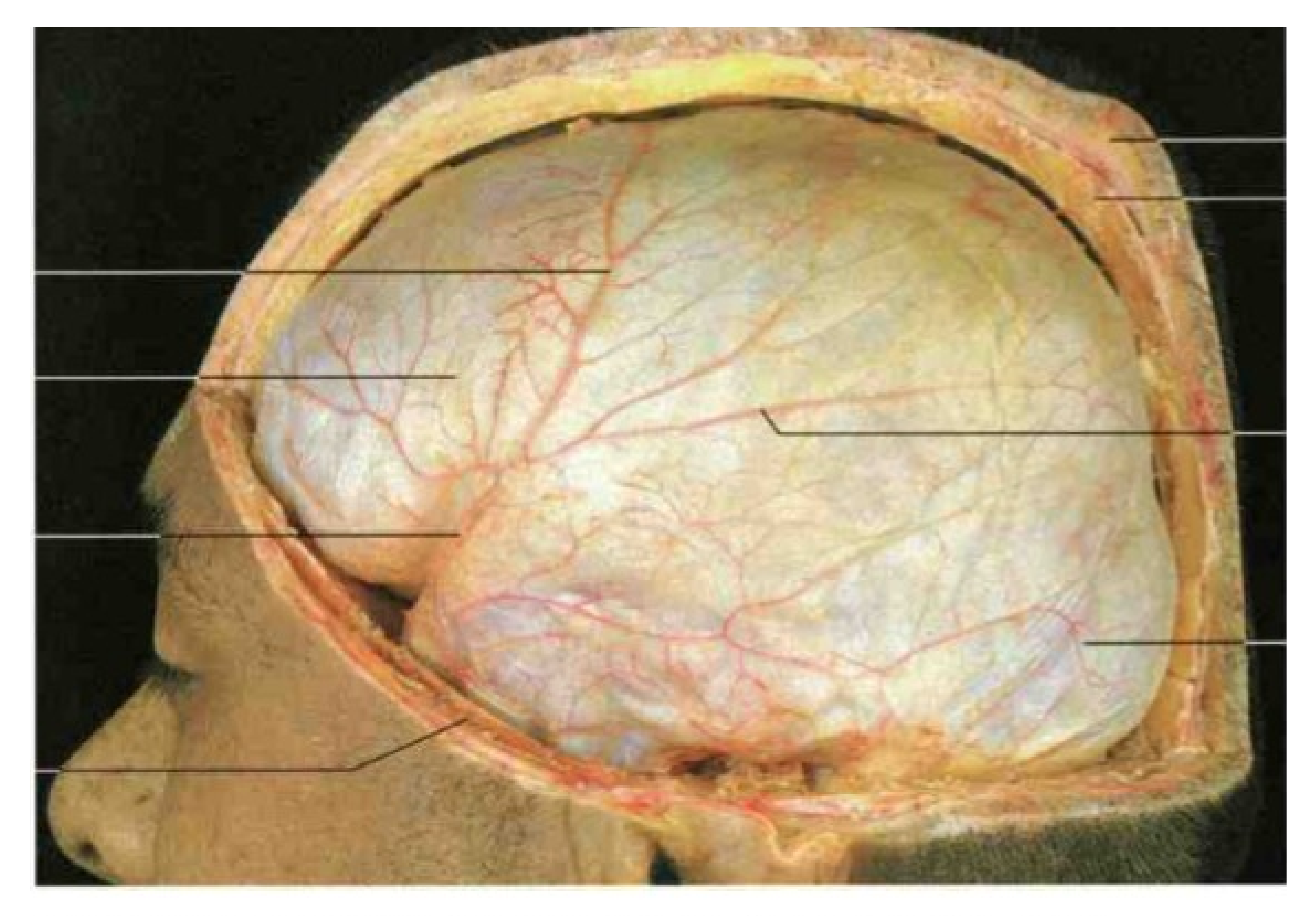


<u>**Center of pterion**</u> is 4 cm above the middle of zygomatic arch and 3½ cm behind frontozygomatic suture.

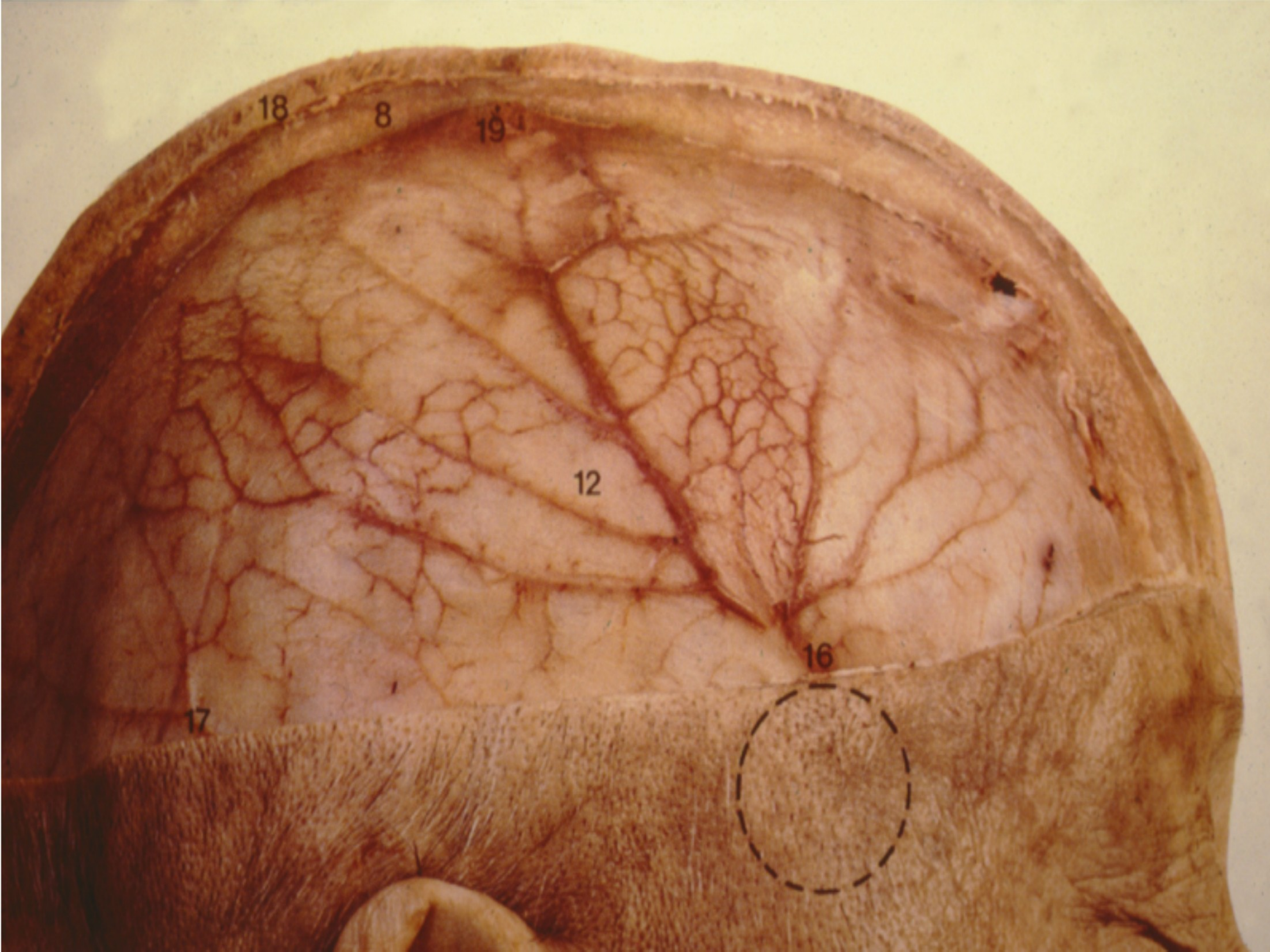
The pterion is grooved on the inside by the middle



Middle Meningeal Artery



Dissection of dura mater and meningeal vessels. Left half of calvaria removed.



18
8
19
12
16
17

Middle Meningeal Artery

<u>Surface Anatomy:</u>

a. Artery enters skull opposite a point *immediately* above the middle of zygomatic arch.

b. It terminates into 2 terminal divisions 2 *cm* above the middle of zygomatic arch.

c. Center of pterion is *4 cm* above the middle of zygomatic arch and 3½ cm behind fronto-zygomatic suture. The pterion is grooved on the inside by the middle meningeal vessels, (*It is the thinnest part of the skull and is liable to fracture*).

<u>Applied Anatomy:</u>

<u>A tear in the middle meningeal artery following head injury may cause extradural hemorrhage.</u>

a. The frontal branch is commonly involved. The resulting hematoma presses on the motor area, giving rise to *contralateral hemiplegia*.

b. For decompression, the burr-hole (trephining) is made over the pterion (4 cm above the midpoint of zygomatic arch).

HEAD TRAUMA



❖ **Epidural hematoma (Artery) middle meningeal artery rupture**

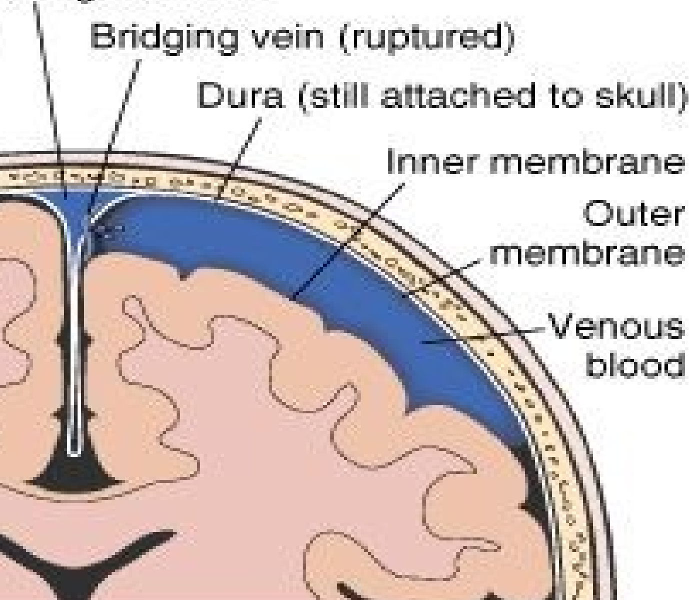
Usually due to blow to the side of the head at the pterion (area where skull is thinnest/easiest to fracture).

Fracture may rupture the anterior branch of middle meningeal artery.

2. Subdural hematomas (Veins) usually of venous origin

tears in bridging veins that cross the subdural space.

is more common



A. Epidural hematoma

B. Subdural hematoma

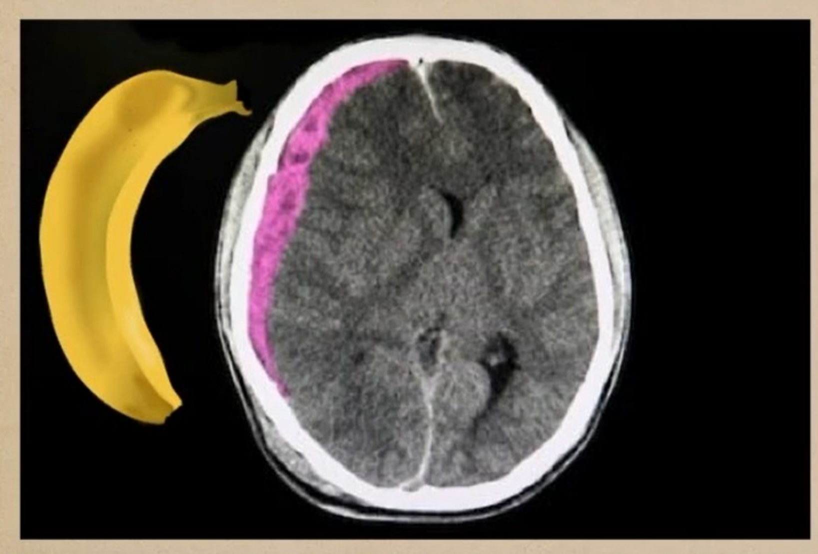
HEAD TRAUMA



Extradural hematoma

Shift of the falx cerebri

Subdural Hematoma



- Concave/Crescent-Shaped
- Bridging Veins
- Elderly, Alcoholics

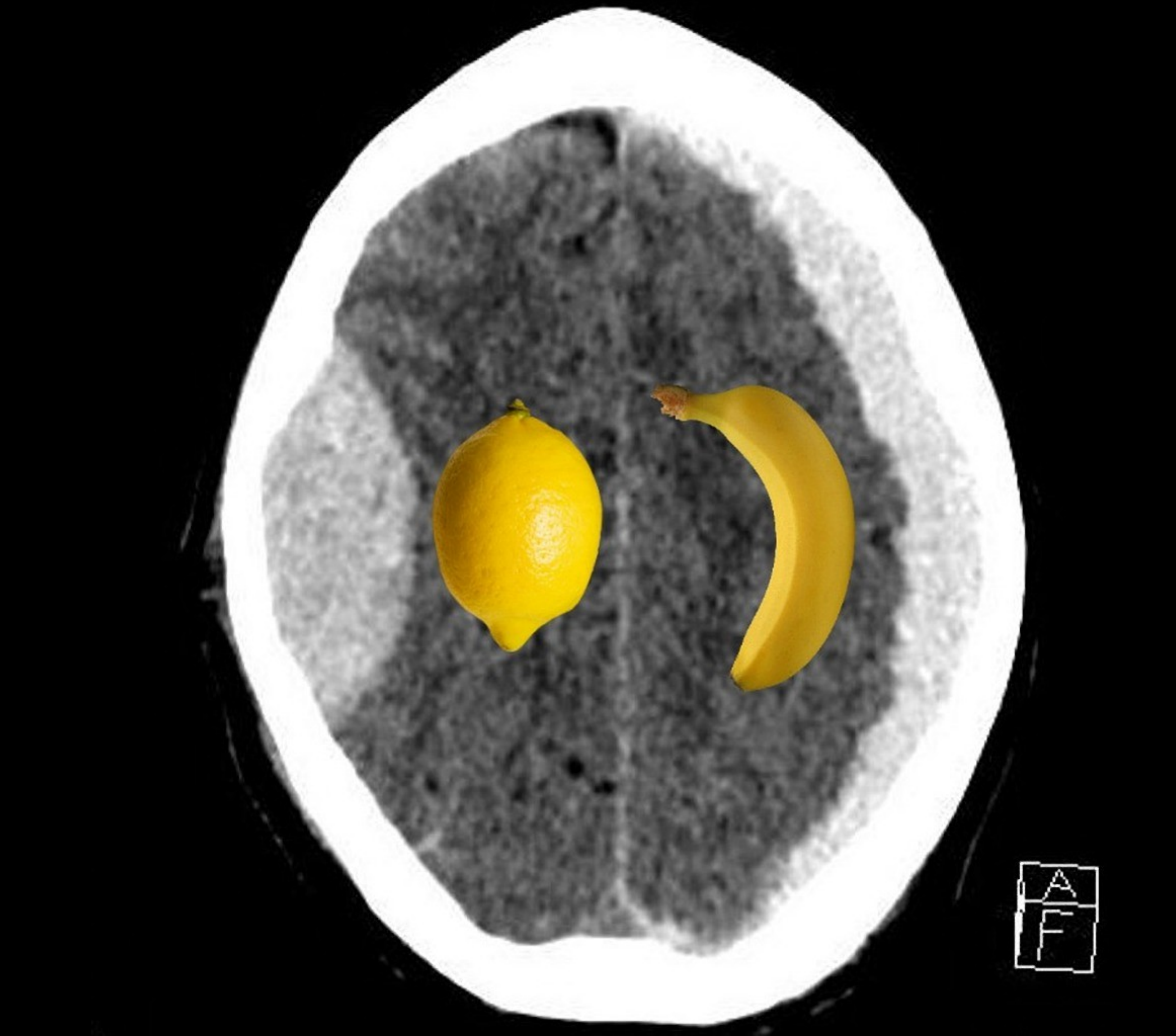
suB = Banana

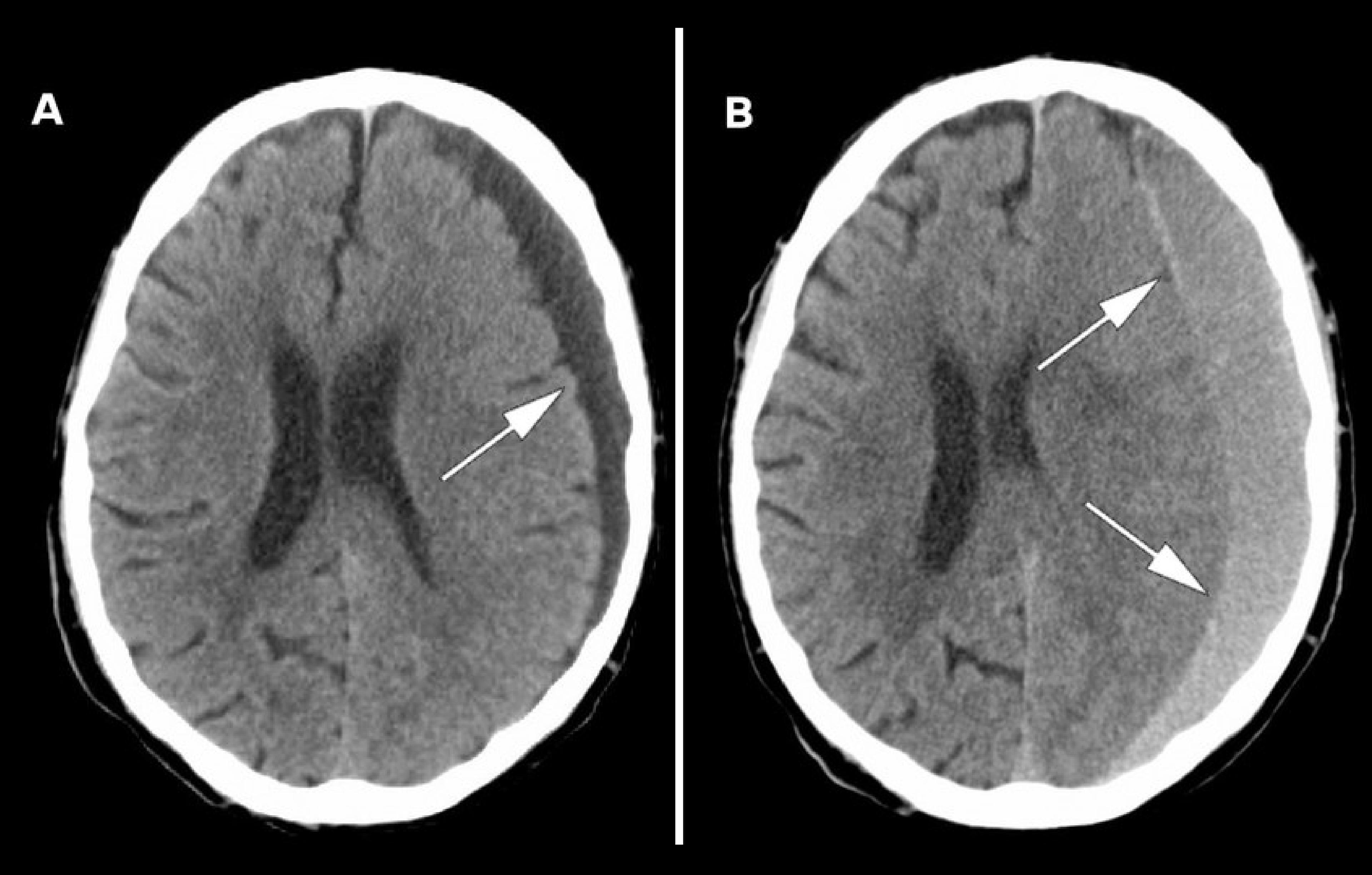
Epidural Hematoma

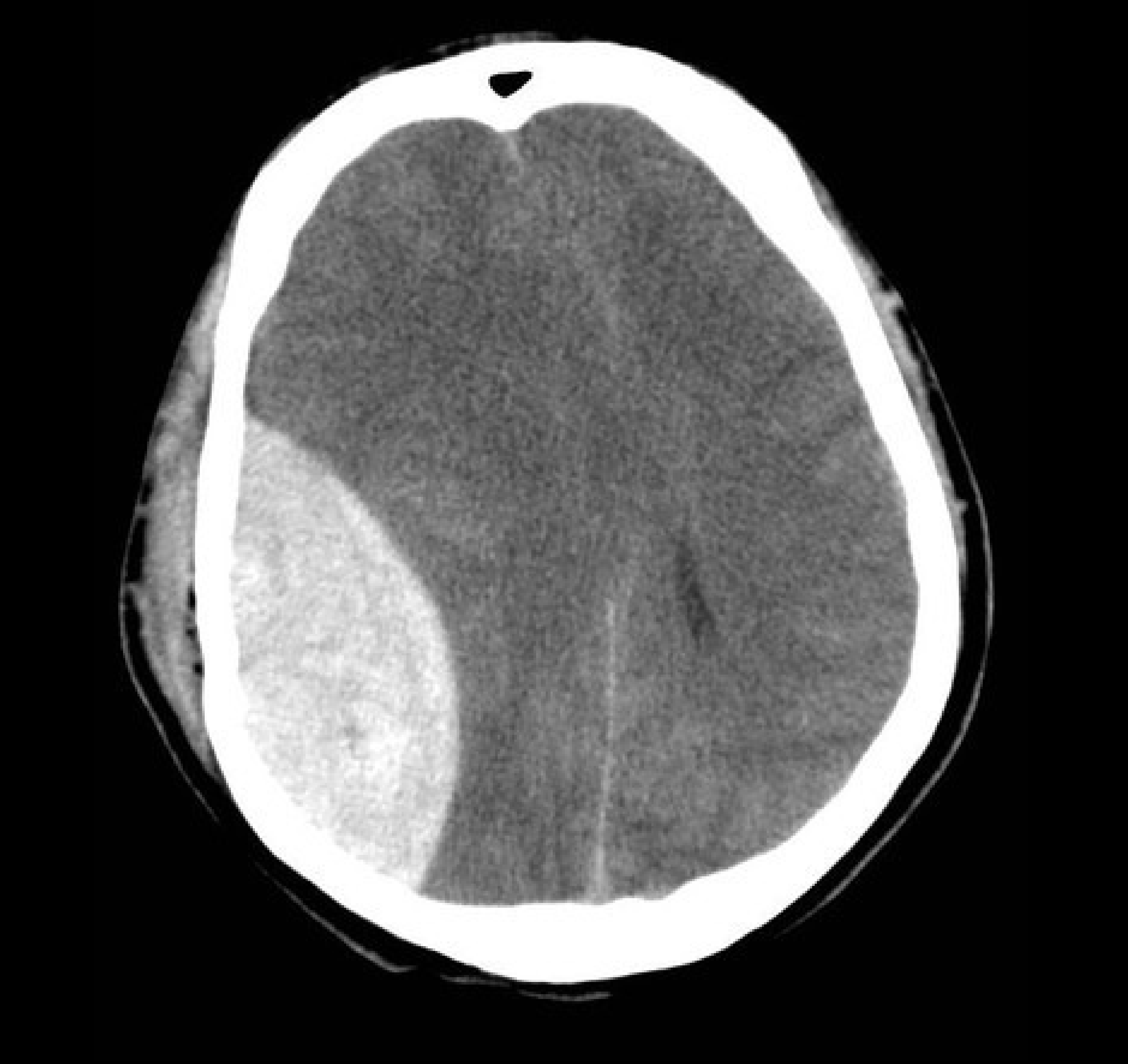


- Convex/Lens-Shaped
- Middle Meningeal Artery
- "Lucid Interval"

Epi = Pie = Lemon

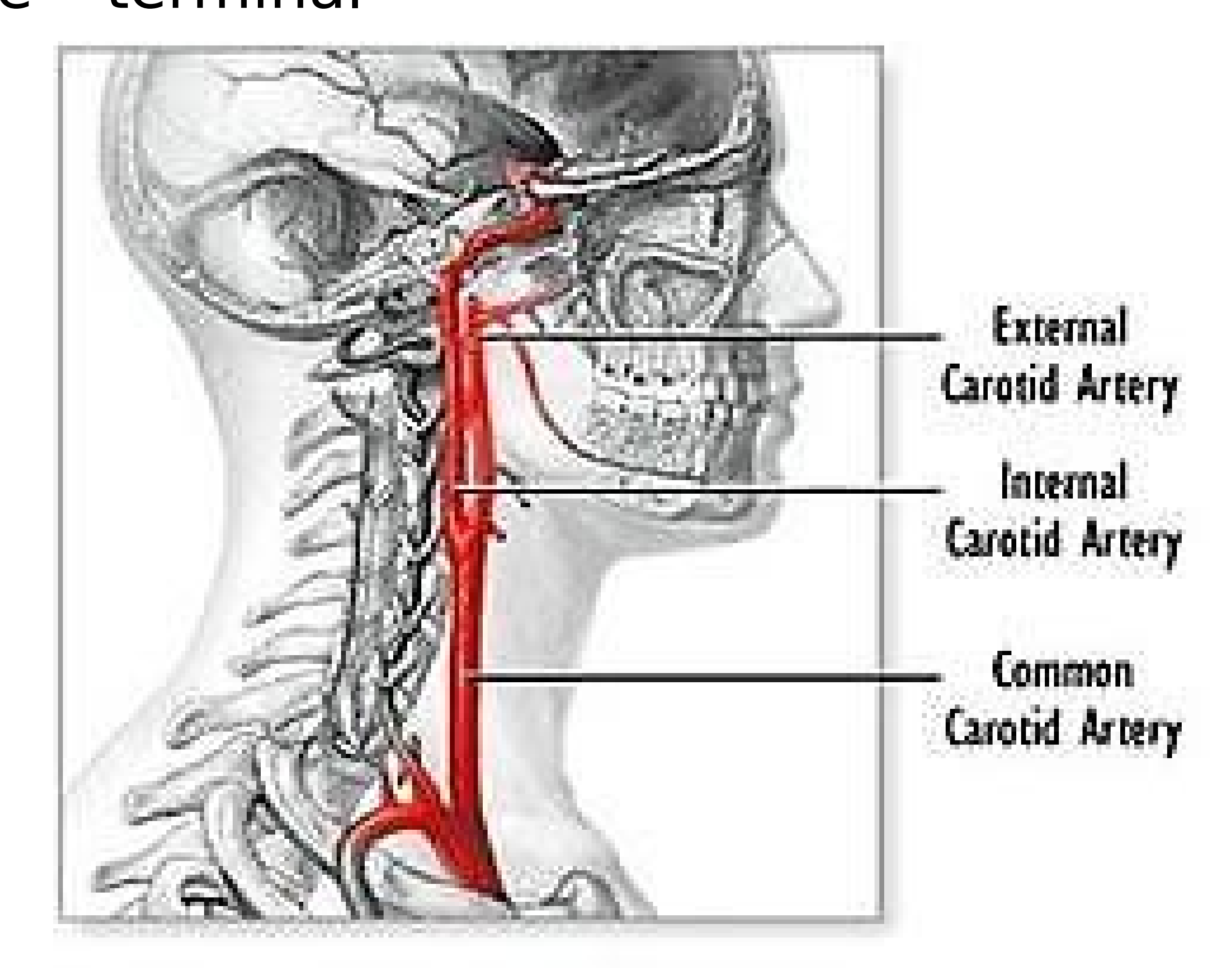

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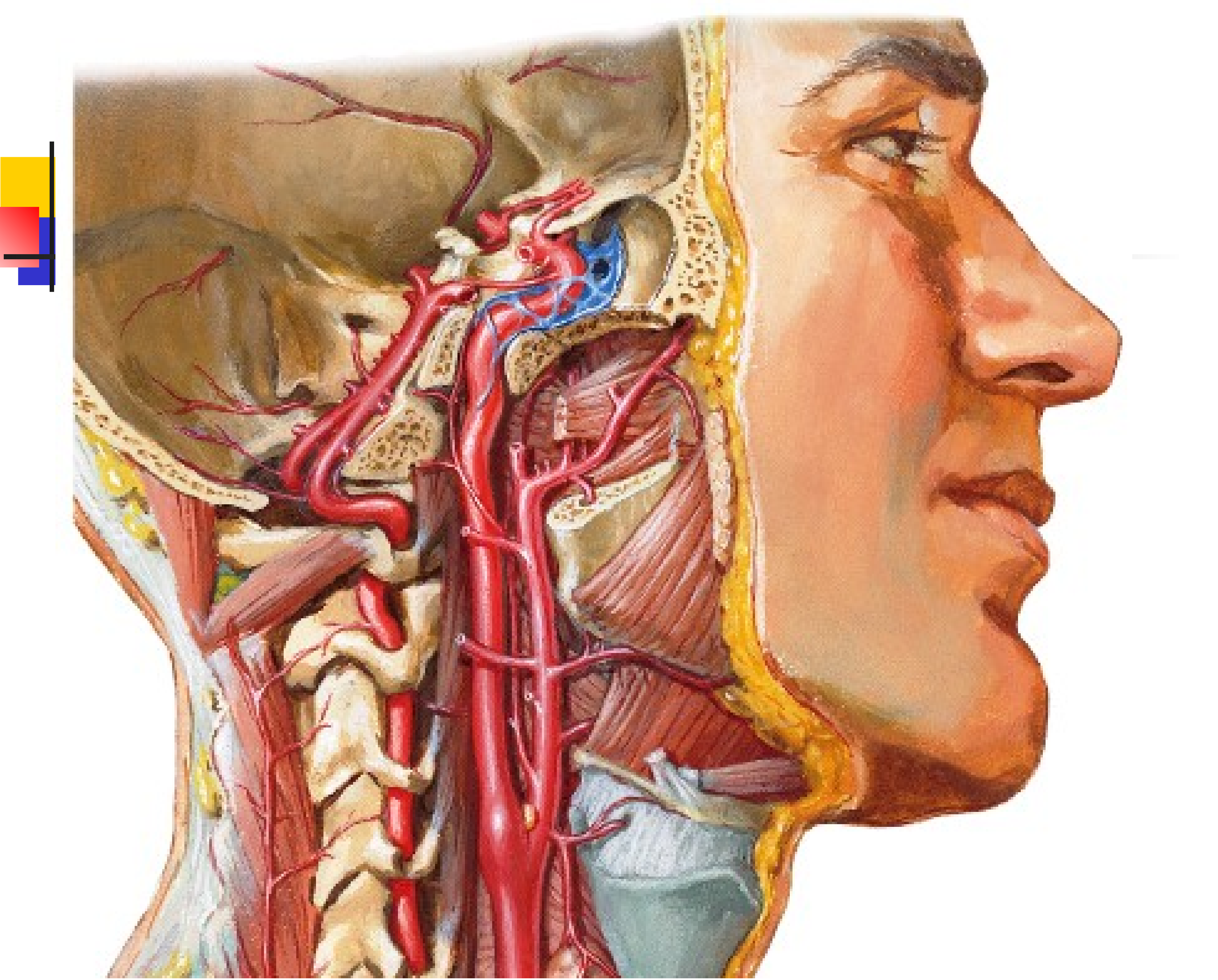

A
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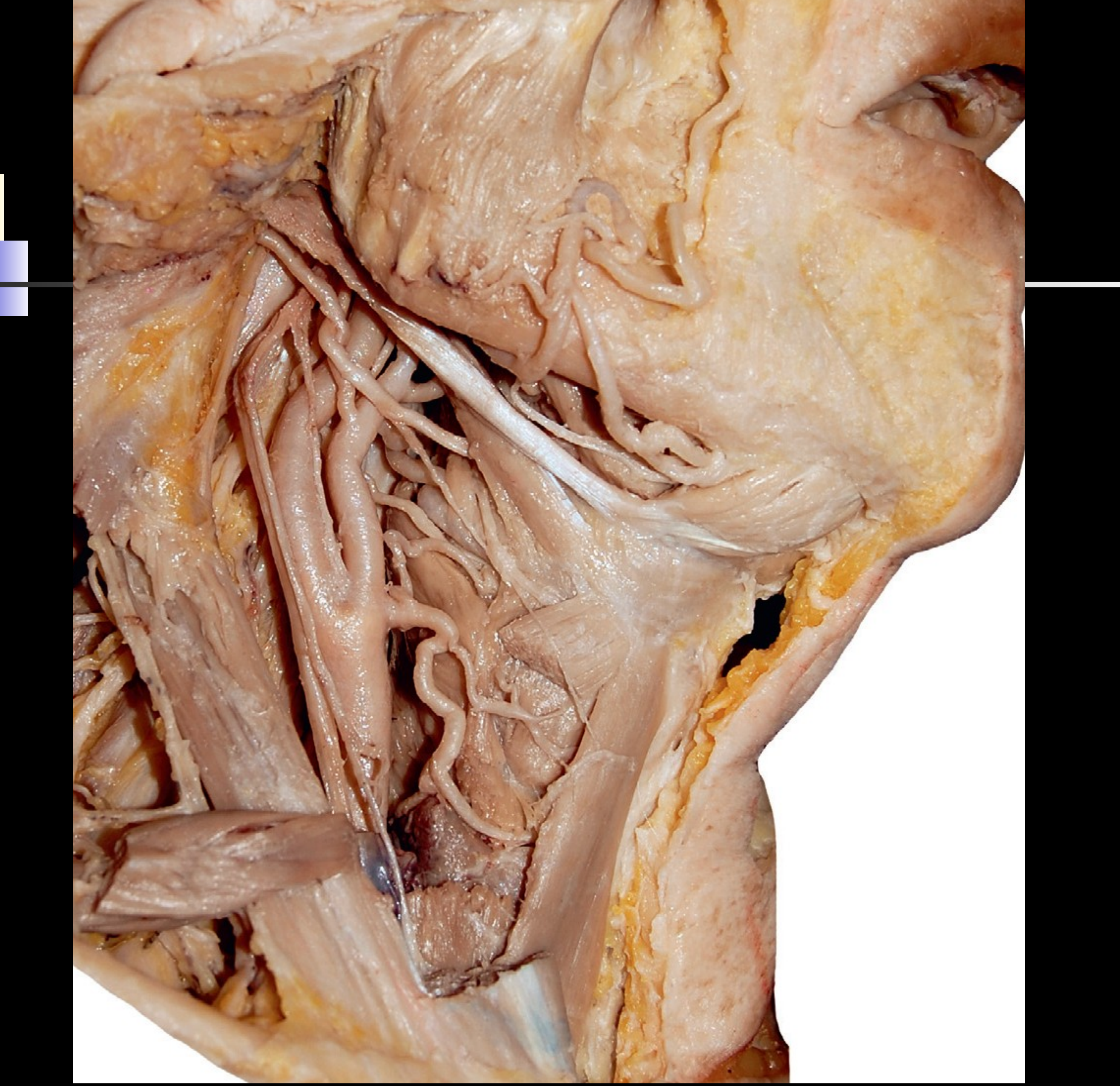


Internal carotid Artery

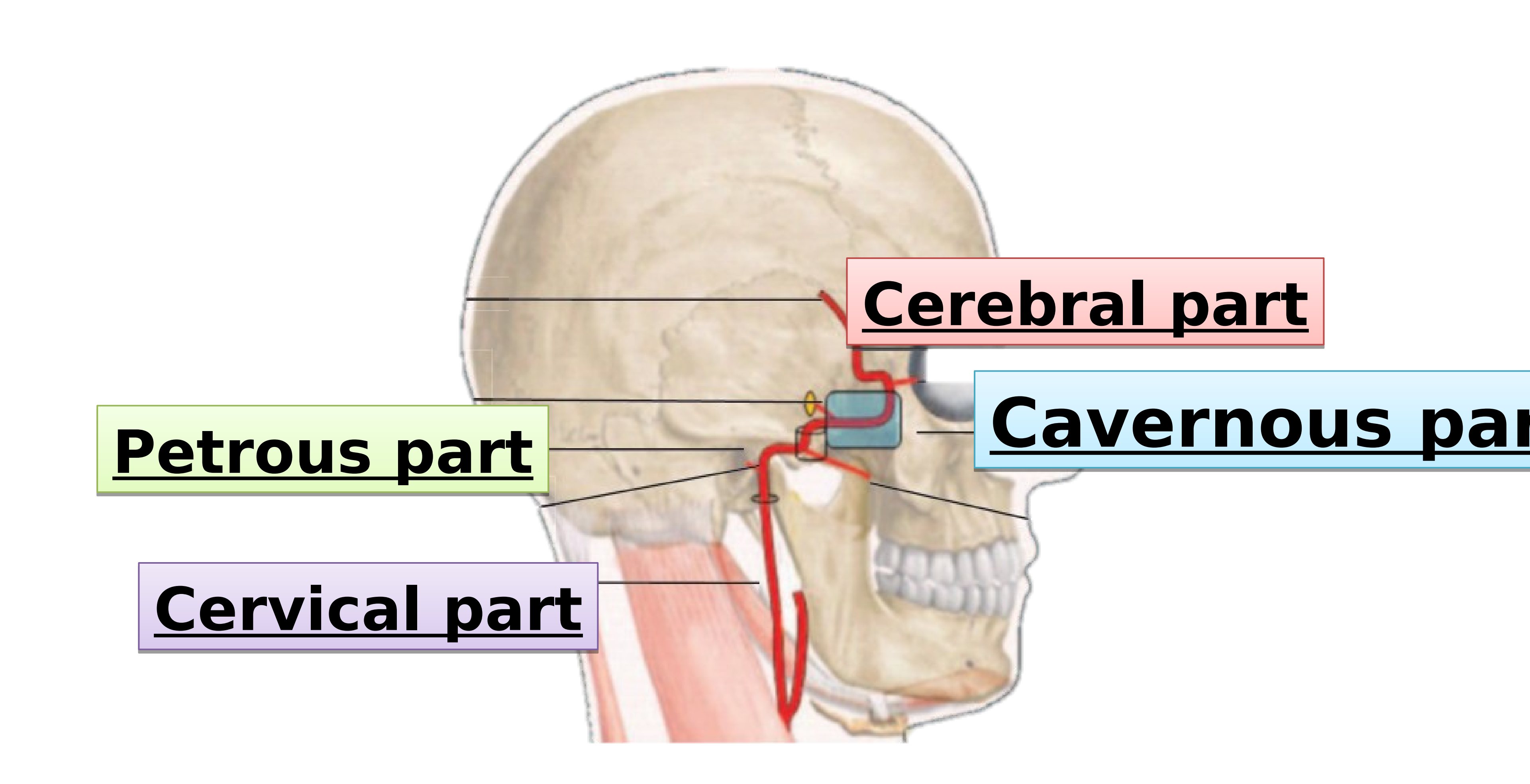
Origin: Begins in the neck as one of the terminal branches of CCA







Internal carotid Artery



Parts of the ICA

1. Cervical
2. Petrous
3. Cavernous
4. Carotid siphon
5. Cerebral



References:

1 Snell's clinical anatomy by regions (2019): 10th Edition

2- Clinically oriented anatomy, K.L. Moore & A. F. Dalley

3- Grey's anatomy for students, Drake et. al.